

# **NAVAL POSTGRADUATE SCHOOL**

## **Monterey, California**



## **THESIS**

**AN ANALYSIS OF THE EFFECT OF THE U. S. MARINE  
CORPS' LUMP SUM SELECTIVE REENLISTMENT  
BONUS PROGRAM ON REENLISTMENT DECISIONS**

by

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December 2001

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SELECTIVE REENLISTMENT BONUS PROGRAM ON REENLISTMENT  
DECISIONS**

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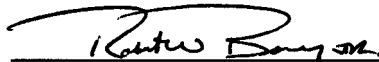
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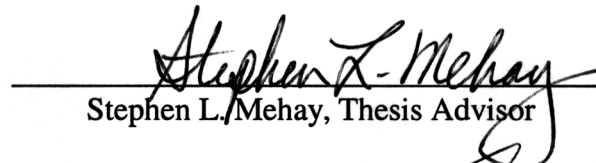
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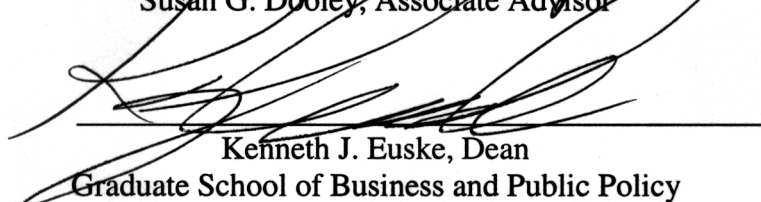
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## **ABSTRACT**

This thesis analyzes the effect of the United States Marine Corps instituting a lump sum Selective Reenlistment Bonus (SRB) Program on reenlistment decisions of first-term enlisted Marines. Between fiscal year 1982 and fiscal year 2000, Zone A reenlistees were paid 50 percent of their SRB on the date of reenlistment, and the remaining 50 percent was paid in annual installments over the reenlistment contract period. In fiscal year 2001, under the new program Marines received 100 percent of the SRB upon reenlisting. The thesis surveys the literature on models of enlisted retention. The thesis empirically examines the impact of personal characteristics, civilian pay, unemployment, and the lump sum bonus on reenlistment decisions. Marine retention probabilities under the lump sum payment program are compared to the probabilities under the standard partial-annuity payment system. The results show that the lump sum bonus is associated to a 5.8 percentage point increase in the reenlistment probability. A one-level increase in the SRB multiple during fiscal year 2001 is related to a reenlistment rate increase of 2.6 percentage points.



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wonderful daughters, through whom I am constantly reminded that all things do work together for good.

# **I. INTRODUCTION**

## **A. PURPOSE**

The purpose of this research is to analyze the effect of the United States Marine Corps' Lump Sum Selective Reenlistment Bonus (SRB) Program on reenlistment decisions of first-term enlisted Marines. This thesis will compare Marine retention probabilities under the lump sum payment program to the retention probabilities under the standard partial-annuity payment system.

## **B. PROBLEM**

The All-Volunteer Force (AVF), initiated in 1973, has generated a number of operational and policy challenges for the Department of Defense (DoD) and the United States Marine Corps. Not the least of these challenges has been the retention of quality first-term enlisted personnel. The problem of retention of first-term personnel has been the subject of many studies sponsored by the DoD and the Marine Corps. These studies reveal that certain factors consistently influence an individual's decision to reenlist in the military.

Civilian employment opportunity has been one consistently important predictor of retention. The robust economy of the late 1990s, along with the low unemployment rates of that period, fueled the interest of young people to attain college degrees and seek employment in the private sector. This state of affairs made retaining quality personnel extremely difficult as it created attractive and competitive civilian alternatives to a military career. The perception among active-duty personnel that there are better opportunities, better pay, and a better quality of life in the private sector provided incentives for active duty personnel to depart from the military upon the expiration of their current contract.

The strong state of the civilian employment situation has motivated military manpower planners to initiate policies that will stabilize the career force in the aggregate and eventually reduce the required first-term reenlistment rate. In the meantime, planners must retain a targeted number of first-term Marines in order to meet the requirements of the overall total force structure. Credible research has demonstrated an association

between the reenlistment propensity of quality Marines and higher monetary salaries and bonuses. Therefore, planners have continued to depend upon the Selective Reenlistment Bonus (SRB) as a tool to stimulate reenlistments.

Marine Corps manpower planners use the Selective Reenlistment Bonus as a tool to manage and shape the career force. The largest percentage of SRB funds are programmed for Zone A reenlistees. Zone A is the decision point where a Marine is first eligible to be paid a reenlistment bonus. This eligibility zone encompasses all enlisted Marines who are within 12 months of the end of their first contract (provided that they will have completed at least 17 months of continuous active duty, but not more than six years of active duty on the date of reenlistment). Because of the military's supply constraint that prevents lateral entry into the career force, the Zone A reenlistment point is critical for manpower planners. Therefore, Zone A SRB payments are carefully modeled, managed, and implemented via official policy. Additionally, substantial funds are obligated to support the reenlistment bonus program.

Between fiscal year 1982 and fiscal year 2000, Zone A reenlistees were paid 50 percent of their SRB (in return for a minimum contract obligation of four years) on the date of reenlistment. The remaining 50 percent was paid in annual installments over the remaining reenlistment contract period. In February 2000, the Marine Corps' Deputy Chief of Staff for Manpower and Reserve Affairs stated that lump sum SRBs would positively influence the reenlistment decisions of indecisive Zone A eligible Marines. [Ref 1:p. 72] A Naval Postgraduate School Master's thesis completed by Major Dave Ross, in March 2000, agreed with the General's statement and stated further that net social benefits would be positive from a policy of paying bonuses in a lump sum. [Ref 1:p. 73] Commencing in fiscal year 2001, Marines receive 100 percent of the SRB owed them upon reenlisting. Zone A payment caps remained at \$30,000. [Ref 2:p. 2]

In May 2001, The Office of the Secretary of Defense (OSD) received a request from the Office of Management and Budget (OMB) asking for OSD's opinion on nominating SRB for an "output measure" for the fiscal year 2003 President's Budget. As an "output" OMB intended to look at how successful the services have been in retaining those occupational fields receiving SRBs. As an "outcome" they would look at the

impact on military readiness when critical specialties are fully manned. The OSD request contributed to Marine Corps manpower planners' interest in evaluating how effective the lump sum payment method of SRB is as an incentive to increase the propensity of enlisted Marines to reenlist. [Ref 3]

Furthermore, the need for empirical evidence demonstrating the effect of the SRB program on the Zone A eligible population's propensity to reenlist came to the forefront immediately following the OMB request. In October 2001, the Marine Corps initiated the Subsequent Term Alignment Plan (STAP). STAP is a force-shaping tool that intends to align the career force more closely to manpower requirements. STAP will invest heavily in the experience levels of career force Marines (those Marines with more than 72 months of active duty time). At the time of this writing (November 2001), manpower analysts noted that in order to support this initiative with SRB dollars, under the current SRB funding constraints, manpower planners will be required to decrease the dollar amount of bonuses offered to Zone A eligible Marines. [Ref 5:p. 8] Unfortunately, the effectiveness of setting funding requirements in this effort to target reenlistments in the career force may be hampered by the absence of any analysis that captures the effect of the lump sum payment method of SRB upon reenlistment behavior. [Ref 4]

Therefore, Marine Corps manpower planners have indicated that it is essential to determine the actual effect that the lump sum payment method has upon Marines' propensity to reenlist. However, it is essential to note several potential issues with determining the effect of the lump sum payment SRB program. First of all, not everyone who was eligible and wanted to reenlist could reenlist in the SRB-targeted Military Occupational Specialty (MOS) for which they were eligible. Secondly, the lump sum payment program commenced in October 2000 and this study will use data available through 30 September 2001. As with most new programs, there will be a "honeymoon period" during which the program may demonstrate relatively unusual success prior to settling into a state of effectiveness where numerous tangible and intangible determinants may be controlled. Subsequent analysis will be necessary in order to capture effectiveness a few years further into the program. [Ref 14:p. 314] It should be noted, at the same time, the SRB program in fiscal year 2001 was shut down on 14 March 2001

due to budget limitations. Manpower planners speculated that most Marines who would have been influenced by a SRB reenlisted during the last 30 days of the program.

Finally, it is outside the scope of this research to control for the other military services. In other words, other military branches, such as the Navy and Air Force have not yet initiated a lump sum SRB payment program, but are experiencing real improvements in their first-term reenlistment rates. [Ref 7:p. 9 and Ref 8:p. 2] The Marine Corps, in theory, is subject to the same retention influences as the other services. Therefore, the estimated marginal effect of the lump sum payment program on Marines may be much smaller or larger when compared to the other services. Finally, intangible factors such as the election of the new U. S. President, quality of life issues, and innumerable other world events may provide a surge of optimism amongst potential reenlistees. [Ref 9] Limited time and data availability restrict the ability of this study to capture every possible determinant of reenlistment rates. Although these challenges are essential to bear in mind, this research will endeavor to provide insight into the effect of the SRB lump sum payment method upon reenlistment behavior.

### **C. RESEARCH QUESTIONS**

The purpose of the Marine Corps' SRB program is to "assist in attaining and sustaining adequate numbers of career enlisted personnel in designated Military Occupational Specialties and within particular years-of-service groupings." [Ref 10:p. 2] Since the SRB program is the "primary monetary incentive for inducing people to reenlist," [Ref 11:p. 1] the Marine Corps has a vested interest in understanding the effect of changes in SRB policy on the propensity of enlisted Marines to reenlist. This study researches Marine retention probabilities to better understand the effect of the lump sum payment program as an incentive to reenlist.

There are several questions that this study attempts to answer regarding the effect of the lump sum payment program.

- What was the change in first-term retention rates as a result of changing the Selective Reenlistment Bonus payment method to lump sum?
- What is the impact of personal characteristics (e.g., age) on reenlistment decisions?
- What is the impact of civilian pay and unemployment on reenlistment decisions?

- What is the impact of the SRB multiple under the installment and lump sum payment methods?

This thesis will specify a bivariate logit model of enlisted retention in order to analyze the impact of the lump sum SRB payment method and selected personal and economic determinants on reenlistment probabilities.

#### **D. SCOPE AND METHODOLOGY**

The scope of this thesis includes a literature review to identify the factors that, on average, have been found to influence the propensity of an enlisted Marine to reenlist. The effect of the SRB will be closely scrutinized during the literature review; a historical perspective of the SRB program and retention rates will be included. An estimated model of enlisted retention will be developed and presented to evaluate the effect of SRB and the payment method. This thesis will focus solely on Zone A Marines who were at their first reenlistment decision point and will not investigate SRB policy change impacts on Marines in Zone B or C.

The methodology used in this thesis research consists of the following steps: 1) a literature review of retention studies, books, periodicals, web-based articles, prior theses, and other library, military, and social science information resources; 2) interviews of personnel from Headquarters, Marine Corps, Code MPP-20, The Center for Naval Analyses, and other manpower experts; 3) collection and compilation of a data-base of all active-duty enlisted Marines who were at their first Zone A reenlistment decision point between fiscal years (FY) 1996 and 2001; 4) estimation of a model of enlisted Marine retention; 5) regression analysis and presentation of alternative specifications of the retention model in order to evaluate the sensitivity of the effect of SRB to an increasingly inclusive set of controls.

#### **E. ORGANIZATION OF STUDY**

Chapter I. Introduction. Explains the purpose and background of this thesis, outlines the research questions, and outlines the thesis structure.

Chapter II. Literature Review. This chapter provides a review of prior retention and SRB studies. The review is conducted in order to identify personal characteristics and economic determinants that have been found to have an impact upon enlisted persons' reenlistment decisions.

Chapter III. The Marine Corps' Selective Reenlistment Bonus Program. The third chapter provides an overview of the Selective Reenlistment Bonus program in the Marine Corps, discusses historical SRB contract data, and reviews policy related to the SRB program. Additionally, this chapter offers historical insight into the possible reasoning behind the Marine Corps' decision to implement the lump sum payment plan for the SRB.

Chapter IV. Data and Model Development. This chapter describes the data sources used for the models, data restrictions that were imposed, candidate explanatory variables, and the expected effects of the explanatory variables on the Zone A enlisted Marine's reenlistment decision. Additionally, this chapter discusses the construction of the civilian unemployment rate, and the military-to-civilian pay index variables. Finally, this chapter provides descriptive statistics for Zone A reenlistments for fiscal years 1999 through 2001.

Chapter V. Logit Model Results. This chapter discusses analytical results for the effect of the lump sum SRB, personal characteristics, civilian unemployment rates, and the military-to-civilian pay index on reenlistment. The results of estimating the bivariate model, described in Chapter IV, are presented and discussed.

Chapter VI. Summary, Conclusions, and Recommendations for Further Research. This chapter summarizes the results of the bivariate model and analysis of data in regard to the Marine Corps' Lump Sum Selective Reenlistment Bonus Program. Finally, recommendations for future research are discussed.

## **II. LITERATURE REVIEW**

### **A. INTRODUCTION AND REVIEW**

Social science research often bases model specification on a literature review of “what other researchers have done on that topic.” [Ref 38:pp. 655-656] Numerous studies addressing economic theory, military manpower research, methodological issues, and alternative techniques have identified a broad spectrum of pecuniary (e.g., bonuses) and non-pecuniary factors (e.g., gender) that influence reenlistment decisions (see [Ref 19] and [Ref 27]). For example, the direction of relationships between bonuses and propensity to reenlist “has been well established both theoretically and empirically. Other things being equal, larger bonuses...are associated with higher reenlistment rates.” [Ref 16:p. 6] Determining a suitable model specification and estimation technique can often be based on a review of previous research.

Several studies have examined not only the effect of SRBs but also the method of payment. Others have not studied method of payment, but have focused on monetary factors. In a 1982 study, John Warner and Matthew Goldberg used a logit estimation to analyze the effect of reenlistment bonuses and regular military compensation on the probabilities of reenlistment and extension among first-term Navy enlisted personnel. Their paper was the first to explicitly study the three options that face a sailor at the end of his enlistment when a sailor may choose to: 1) reenlist; 2) extend his enlistment; or 3) leave the Navy. Warner and Goldberg grouped all occupational ratings into nine occupational categories that they judged “to be similar in terms of skill requirements, tasks performed, and work environment.” [Ref 23:p. 2] The hypothesis was that reenlistment rates are sensitive to military compensation, but that the relationship varies across occupational categories.

Warner and Goldberg found that “pay elasticities vary substantially across occupational categories.” [Ref 23:p. i] They found that under the lump sum SRB method a one-multiple SRB increase was related to a reenlistment rate increase of 2.0 to 3.9 percentage points, depending on the occupational category. When the civilian



unemployment rate was increased by one percentage point, the rate of reenlistment in any given occupational category also increased.

Hosek and Peterson [Ref 17] developed logit model estimates for reenlistments, extensions, and retention with a sample of Army, Navy, and Air Force data between FY76 and FY81 in order to compare the effects of annualized versus lump sum SRB payment methods. Each military occupational specialty (MOS) had its own intercept in order to control for the effects of unobserved factors (simultaneous equation bias). These factors include the “unchanging aspects of work conditions in the MOS, promotion policy, reenlistment eligibility criteria, rotation policy and career development opportunities.” [Ref 19:p. 23] A variable identifying the presence of a bonus was specifically designed to compare the effects of the 1979 change in SRB payment methods, from fiscal year 1976 through 1981.

Hosek and Peterson defined retention as the decision to either reenlist or extend. They found: 1) that controlling for simultaneity bias was essential; 2) an increase in the military/civilian wage index increases both the reenlistment and retention rate; 3) higher bonuses can mitigate the effects of lower civilian unemployment; 4) reenlistment bonuses, whether lump sum or installment, are effective in increasing the reenlistment rate; and 5) at the first term reenlistment point, lump sum bonuses are more cost effective than installment bonuses in increasing expected man-years in an occupation. Furthermore, they noted that the added advantage of lump sum bonuses comes primarily from shifting personnel from extension to reenlistment; lump sum reenlistment bonuses are effective in increasing the reenlistment rate and decreasing the extension rate. [Ref 17:p. 52]

Donald Cymrot used a logit model with data from October 1979 through December 1985 to analyze the effects of SRB on Marine Corps retention. He addressed the installment method of paying SRB by noting that spreading out SRB defers some payments into future fiscal years, while reducing current budgetary requirements. Additionally, annuity payments of SRB reduce the effectiveness of each dollar of SRB payments, assuming that Marines value a dollar today more than a dollar in the future. [Ref 22:p. 8]

Cymrot grouped Marine Corps military occupational specialties into 22 skill families (MOSs that require similar skills) arguing, “the magnitude of the effect is not likely to be the same in all jobs and in all occupations because circumstances and personnel vary.” [Ref 22:p. 2] Like Hosek and Peterson, Cymrot defined retention as the decision to either reenlist or extend and used SRB, civilian and military pay, the unemployment rate, the suspension of SRB payments, and rank as independent variables. Mehay highlighted a key result of Cymrot’s study by noting that, “if the main purpose of a study is to examine the impact of the reenlistment bonus, then mixing the pay variables with the bonus variable will bias the effect of the bonus.” A specification that uses a single relative pay measure is more consistent with economic theory. [Ref 27:p. 19]

Cymrot used the logit model instead of the bivariate approach arguing that in the logit model: 1) increases in the bonus can either increase the retention rate or have no effect; 2) results can be adjusted for changes in other conditions; and 3) it is possible to predict outside the range of the observations. [Ref 22:p. 38] Cymrot found that in nearly all of the skill families “the reenlistment rate increases with the bonus multiples, and in many cases the retention rate (which includes both reenlistments and extensions) also increases with bonus multiples.” [Ref 22:p. 60] The only other factor that was found to have a significant impact upon the propensity to reenlist was rank.

Cylke, Goldberg, Hogan, and Mairs presented estimates of the personal discount rate of young people making military career decisions resulting from a change in military compensation policy. Prior to April 1979, reenlistment bonuses were paid in annual installments over the individual’s reenlistment period. Beginning on 1 April 1979, the entire bonus was paid in lump sum at the date of reenlistment. [Ref 18:p. 1] In comparing the effects of bonuses on the reenlistment rate in fiscal years 1978 and 1980, their study included interaction variables between the bonus multiple and fiscal year dummy variables. The interaction variables were created to estimate the effects of bonuses on reenlistment rates separately under the two policy periods and the transition period. That is, the interaction variables allowed the authors to test the hypothesis that the policy change in fiscal year 1979 led to an increase in the effect of bonuses. [Ref 18:pp. 6-7]

Quester and Adedeji conducted a detailed examination of Marine Corps reenlistment decisions between FY80 and FY90. The purpose of their study was to determine the impact of changes in the characteristics of enlisted Marines “on reenlistment decisions of first-term enlisted personnel and the ability of the Marine Corps to retain quality personnel with respect to selective reenlistment bonus, grade, and dependency status.” [Ref 16:p. v] At the time of their study there was “little information regarding how these Marines respond to reenlistment decisions.” [Ref 16:p. 1]

Their logit model used final decisions of “reenlist or didn’t reenlist” (no extensions), and restricted their data set to Marines within the first 72 months (Zone A) of active service. Quester and Adedeji used the civilian unemployment rate in their model specification, and applied a pay index that reflects the changes in average levels of military to civilian pay. They calculated elasticities from their logit model and determined that a one-percentage point increase in pay should lead to a 2.1 percentage point increase in the reenlistment rate. The authors noted that, on average, a one-level increase in the SRB multiple raised the reenlistment probability by 6 percentage points. [Ref 27:p. 16] Their results included the determination that the average impact of the SRB is greater for Marines who score higher on the Armed Forces Qualification Test, and, on average, marital and dependency status have a positive impact upon a Marine’s propensity to reenlist. Other factors that were found to have a significant impact upon the propensity to reenlist were race, gender, and length of initial contract.

North [Ref 28] chose a binary logit model (member reenlists or does not reenlist) to estimate the probability of Marine Zone A reenlistments. He restricted his longitudinal data to Marines who were recommended and eligible for Zone A SRBs between October 1986 and September 1992, which resulted in a sample of approximately 40,000 observations.

North’s results were similar to those of Quester and Adedeji, with the main exception of finding a smaller pay elasticity [Ref 27:p. 31]. Overall results indicated that higher SRB multiples, higher rates of civilian unemployment, and higher military-to-civilian pay ratios are associated with higher reenlistment rates. For example, North noted that a one-level increase in the SRB multiple raises the predicted reenlistment rate

by 7.1 percentage points, and a one percentage point increase in the military-to-civilian pay ratio results in a .2 percentage point increase in the reenlistment rate. North discovered that most military occupational specialties have higher reenlistment probabilities relative to the military occupational specialty of Infantry. Mehay points out that the Marine Corps uses the logit model in Quester and Adedeji and North to forecast the impact of changes in SRB multiples by one level on reenlistment rates (by MOS and zone). [Ref 27: p. 17]

Michael Hansen applied a seldom-used methodology to estimate the relationship between compensation and retention. Hansen's estimate of military compensation involved a two-step approach focused on basic pay and the SRB. After using personal characteristics of Navy enlisted personnel to predict civilian earnings on a rating-by-rating basis, Hansen used the predicted earnings to estimate the retention relationship mentioned earlier. Hansen's approach was unique as earlier studies "typically calculate the average civilian earnings of veterans across all of the civilian occupations. Using average earnings across occupations may introduce biases in measures of civilian opportunity costs not only because veterans are self-selected military leavers, but also because the civilian occupation they choose may be an outcome of this selection process." [Ref 27:p. 17]

Hansen's civilian pay methodology matched 15 Navy ratings with comparable civilian occupations by using the Defense Manpower Data Center's Occupational Conversion Index (DoD, 1993) as a bridge between the individual ratings and civilian occupations classified in the Current Population Survey (CPS) for 1991 through 1998. He estimated civilian earnings regressions that controlled for the demographic characteristics of education, gender, age, and race and used the estimates as part of a logit model that did not include the demographic characteristics, as they were used to predict civilian earnings.

Hansen's binomial logit model (dichotomous choice between "reenlisting" and "not reenlisting") results were generally consistent with the study completed by Quester and Adedeji although the pay effects were markedly different. Specifically, Hansen noted significant, positive relationships between an enlisted member's AFQT score,

length of initial contract, marital status, and sea-duty status with the member's propensity to reenlist. He also discovered a significant, positive relationship between the unemployment rate and the military-to-civilian pay ratio with the propensity to reenlist. Hansen's estimate from a multinomial model revealed that a one-level SRB increase raised the reenlistment rate by about 3.4 percentage points. Hansen addressed two notable conclusions to policy-makers when he stated that, 1) in recent years it appears that a larger change in compensation is needed to induce the same change in reenlistment; 2) if policy-makers are interested in specifically targeting specific skills, it is important to realize that pay elasticities will vary from one rating to the next. [Ref 12:pp. 43-47]

Ross (2000) evaluated personal discount rates for Marines, and used existing estimates of program effectiveness from current literature to determine the likely impact of switching from the partial installment method to the lump sum payment on Marine Corps enlisted retention in fiscal year 2000. Mehay noted that prior studies have inferred personal discount rates for enlisted personnel that range from 17 percent to 37 percent. An individual whose personal discount rate is .10 would be indifferent between receiving \$20,000 under the partial installment plan or receiving a lump sum payment today of \$18,257 (assuming a 4-year reenlistment). Another way to state this is that a \$20,000 bonus paid under the partial installment method has a present value of only \$18,257 to the decision maker. Shifting to the lump sum plan raises the present value to \$20,000, an increase of \$1,743 or about 10 percent. If the personal discount rate were .20, the individual would be indifferent between \$20,000 paid over time in partial installments versus a lump sum payment of \$17,002, a difference of \$2,980 or 15 percent.

Using actual programmed SRB multiples by occupational field he calculated the value of the SRB multiple under the two payment schemes. Ross estimated the lump sum plan would increase reenlistment rates by 6.8 percent if the personal discount rate = .21, 9.4 percent if the personal discount rate = .31, and 11.65 percent if the personal discount rate = .41. Ross' estimations can be translated into terms applicable to this thesis. That is, if the reenlistment rate in fiscal year 1999 was 22.6 percent, the lump sum plan would increase the reenlistment rate by 1.5 percentage points if the personal discount rate = .21, 2.1 percentage points if the personal discount rate = .31, and by 2.6 percentage points if the personal discount rate = .41. [Ref 27:pp. 25-26 and Ref 1:p. 51]

## **B. SUMMARY**

Analysts hypothesized that the relationship between SRBs and reenlistment rates will be positive and significant, and the literature has supported the argument that SRBs increase both the quantity and quality of reenlistments. [Ref 16:p. v] Studies also have demonstrated that the lump sum SRB method is effective in increasing the reenlistment rate, and is more cost-effective than installment bonuses. Under the lump sum SRB payment method, a one-multiple SRB increase has been found to increase the reenlistment rate by 2.0 to 3.9 percentage points. Several studies noted that a one-level increase in the SRB multiple raised the predicted reenlistment probability by 2.0 to 7.1 percentage points.

Prior research consistently applied the logit model in evaluating the impact of explanatory variables upon reenlistment. Binary logit results often were converted to elasticities in order to more accurately communicate the relationship between a change in an explanatory variable and the reenlistment outcome. Significant explanatory variables fell into three broad categories: 1) economic variables (e.g., unemployment rate, bonuses, and military pay); 2) personal characteristics (e.g., gender, grade, and race); and 3) military occupational specialty.

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### **III. THE MARINE CORPS' SELECTIVE REENLISTMENT BONUS PROGRAM**

#### **A. HISTORY OF THE SELECTIVE REENLISTMENT PROGRAM**

“Basic pay is the largest component of military compensation. The most significant way in which compensation varies across ratings [equivalent to Marine Corps Military Occupational Specialties] is through the payment of selective reenlistment bonuses.” [Ref 12:p. 37] Marine Corps manpower planners to “maintain an adequate level of experienced and qualified enlisted personnel in the peacetime forces of the uniformed services” use selective reenlistment bonus payments as a tool. [Ref 13:p. 395]

Although the SRB program is expensive, costing the Marine Corps upwards of \$40 million in fiscal year 2001, “it can cost less than recruiting and training new personnel or encouraging retention through other alternatives, such as across-the-board pay raises.” [Ref 11: Introduction] Furthermore, studies consistently demonstrate that “the SRB program has proven to be the most efficient and cost-effective way to attain required retention rates in critical skills.” [Ref 15:p. 21] Analysts at the Center for Naval Analyses point out that “SRBs increase both the quantity and the quality of Marine Corps reenlistments.” [Ref 16:p. v] Additionally, the RAND Corporation concludes that reenlistment bonuses are “a potent, versatile component of military compensation. Bonuses may be turned on or off rapidly and targeted on critical skills. They not only increase the retention rate but induce personnel to reenlist rather than extend, thereby increasing expected man-years.” [Ref 17:p. vii]

The source of the present SRB authority is the Armed Forces Enlisted Personnel Bonus Revision Act of 1974. [Ref 13:p. 399] Prior to April 1979, the SRB was paid in annual installments with the maximum amount payable not to exceed \$15,000. [Ref 18:p. 1] Starting on 1 April 1979, Congress allowed “payment of the entire amount of bonus at the beginning of a new reenlistment or extension of an existing enlistment. In 1982, this was changed so that 50 percent of the bonus could be paid as a lump sum and the remainder paid in equal annual installments.” [Ref 19:p. 2]



In 1985, Congress adjusted the program requiring that “at least 75 percent of the bonus payable for reenlistment be paid in a lump sum at the beginning of the period for which the bonus is paid, with any remaining amount paid in equal annual installments.” [Ref 19:p. 402] The 75 percent clause was amended by the National Defense Authorization Act for fiscal years 1988 and 1989 “to provide that the initial installment could not be less than 50 percent.” [Ref 19:p. 402] The rationale for the restriction is a familiar one. As explained by the House Armed Services Committee: “current fiscal realities continue to make such bonus payments infeasible. Accordingly, the committee recommends prohibiting the payment of more than 50 percent up-front lump sum reenlistment bonus during fiscal years 1988 and 1989.” [Ref 19:pp. 402-403]

In March 2000, Major Dave Ross (Marine Corps SRB program manager) noted “SRBs are authorized in section 4.3.3.1 of the Department of Defense (DoD) Directive 1304.21 to be paid using a lump sum payment method.” [Ref 1:p. 4] At the same time, section 8021 of the Fiscal Year 2001 Budget states that, “notwithstanding any other provision of law, none of the funds appropriated by this Act shall be available to pay more than 50 per centum of an amount paid to any person under section 308 of title 37, United States Code, in a lump sum.” However, the Office of the Secretary of Defense (OSD), working with congressional appropriators during fiscal year 2001, successfully repealed the National Defense Authorization Act provision that restricted the up-front payment of bonuses to 50 percent. [Ref 29] Subsequently, Headquarters Marine Corps (Manpower and Reserve Affairs) announced a policy change to the payment method of the SRB. According to Marine Administrative Message 436/00:

In FY01, Marines will receive 100 percent of their reenlistment bonus in one lump sum payment. Marines will now be able to receive the full payment of the SRB owed them upon reenlisting. Previously, Marines received 50 percent of their SRB payment amount upon reenlistment with the remaining 50 percent being paid in equal installments over the following three years. All Marines will be required to receive payment of their SRB using the lump sum payment method. Zone A payment caps remain at \$30,000 in FY01. [Ref 2:p. 2]

## **B. REENLISTMENT POLICY**

Approximately 80% of all new Marine Corps enlistees sign initial contracts obligating them to four years of active service. [Ref 6] Subsequent contracts vary in

length of obligation. When a contract obligation is completed a Marine must “choose to extend or reenlist for a specified period, leave active service and join the reserves, or leave the military entirely.” [Ref 20:p. 50]

Marines in certain Military Occupational Specialties (MOS) may be paid a reenlistment bonus if they fall into one of three opportunity zones upon being eligible and recommended for reenlistment. A Marine with between 17 months and 6 years of continuous service who is eligible and recommended to execute a reenlistment is in SRB Zone A. A Marine with between 6 and 10 years of continuous service who is eligible and recommended to execute a reenlistment is in SRB Zone B. A Marine with between 10 and 14 years of continuous service who is eligible to execute a reenlistment is in SRB Zone C.

In order to receive an SRB, a Marine must: 1) be within 12 months of their Expiration of Active Service (EAS); 2) be eligible and recommended for reenlistment; 3) be serving in the grade of lance corporal or above; 4) reenlist for a minimum period of four years in the Regular Marine Corps within three months after the date of discharge or release from active duty; and 5) be assigned a primary MOS or possess a skill associated with an additional MOS which is SRB-eligible. Furthermore, a Marine can only receive one SRB (which is capped at \$30,000 for Zone A payments) in each opportunity zone. [Refs 2 and 10] Although SRB is offered to Marines in three different zones, “the most critical reenlistment point for the Marine Corps career force planners is the Zone A reenlistment point.” [Ref 1:p. 5]

Bonus payments are based on multiples of the Marine’s monthly basic pay multiplied by years of additional obligated service. For example, an eligible and recommended Corporal (E4) disbursing clerk (MOS 3432) with four years active service during calendar year 2001 would have received a lump sum SRB of \$6,304 upon reenlistment (four year obligation, multiplied by \$1576.20 base pay, multiplied by a 1 SRB multiple). Multiples are normally in the range of zero to five, although they are authorized by MCO 7220.24M not to exceed 10. Internal Marine Corps policy limits the maximum multiple to 5. [Ref 6] The proposed SRB multiples are generated for specific Military Occupational Specialties (307 separate MOSs, which are aggregated into 38

occupational fields, were utilized by the Marine Corps from fiscal year 1996 through fiscal year 2001). All MOSs are assigned an SRB multiple ranging from zero to five. Reference 1 provides a detailed synopsis of the entire SRB multiple process. Zone A reenlistment rate estimates are provided by the Center for Naval Analyses for each of the Marine Corps' 38 occupational fields listed in Table 1.

<b>Occupational Field</b>	<b>Occupational Field Description</b>
01	Personnel and Administration
02	Intelligence
03	Infantry
04	Logistics
05	Marine Air Ground Task Force (MAGTF) Plans
06	Command and Control Systems
08	Field Artillery
11	Utilities
13	Engineer, Construction, Facilities and Equipment
18	Tank and Assault Amphibious Vehicle
21	Ordnance
23	Ammunition and Explosive Ordnance Disposal
25	Operational Communications
26	Signals Intelligence/Ground Electronic Warfare
28	Ground Electronics Maintenance
30	Supply Administration and Operations
31	Traffic Management
33	Food Service
34	Financial Management
35	Motor Transport
40	Data Systems
41	Marine Corps Exchange
43	Public Affairs
44	Legal Services
46	Visual Information
55	Music
57	Nuclear, Biological, and Chemical
58	Military Police and Corrections
59	Electronics Maintenance
60/61/62	Aircraft Maintenance
63/64	Avionics
65	Aviation Ordnance
66	Aviation Logistics
68	Meteorological and Oceanographic Services
70	Airfield Services
72	Air Control/Support/Anti-air Warfare/Air Traffic
73	Navigation Officer/Enlisted Flight Crews
9919	Reporting MOSs

Table 1. Occupational Field Codes and Descriptions.  
Source: [Ref 21:p. 3-TOC-1]

Headquarters Marine Corps (Manpower and Reserve Affairs) utilizes the estimates “as a basis for setting up its First-Term Alignment Plan (FTAP).” [Ref 1:p. 39] The FTAP process was established to prevent promotion stagnation, and over-staffing (which can be caused by reenlisting too many Marines in each MOS). The FTAP determines how many enlisted personnel the Marine Corps will need to bring into the career force. [Ref 1:p. 39] Career force is defined here as those Marines who have reenlisted for a space that was required, by the FTAP, to be filled. The Zone A SRB program supports the execution of the FTAP. Because of the importance placed on the FTAP by the Marine Corps, Zone A reenlistments are restricted to only Marines who are reaching their End of Active Service (EAS) during the FTAP fiscal year. In other words, a Marine with an EAS of October 5<sup>th</sup> will only have five days to reenlist. In the same way, a Marine with an EAS of 1 July 2002 can reenlist on 1 October 2001. [Ref 6]

### **C. PAYMENT METHOD AND RESULTS**

As the Marine Corps has already made the decision to utilize the SRB lump sum payment method, it is beyond the scope of this research to discuss the advantages and disadvantages of switching to a lump sum SRB payment method. Ross (2000), Government Accounting Office (1985), Goldberg and Warner (1982), Cymrot (1987), and Hosek and Peterson (1985) provide detailed synopses of the quantitative and qualitative costs and benefits associated with the SRB installment and lump sum payment methods.

Essentially, analysts argue that paying the SRB in a lump sum payment is: 1) more cost-efficient than the installment method on a dollar-for-dollar basis; 2) more readily visible to congressional and DoD decision-makers; and 3) less limiting to congressional and DoD decision-makers when they have to reduce the SRB budget for purely fiscal reasons. [Ref 11:pp. 7-10] At the same time, the method of paying the SRB as a lump sum payment may: 1) reduce the incentive for reenlistees to complete their initial contract; 2) make the bonus less visible to the service member over the entire length of the contract period; 3) increase the risk of financial loss if members do not complete their reenlistment contracts; and 4) temporarily (until prior year installment

payments are fully paid out) increase the current SRB budget in order to cover the new payment method. [Ref 1:pp. 33-34, Ref 11:p. 9, and Ref 6]

The initial response by enlisted Marines to the fiscal year 2001 introduction of the lump sum SRB payment method was overwhelmingly positive. An “unprecedented number of first-term Marines leapt at the chance to take all their reenlistment cash up front, leaving manpower planners confident that the Marine Corps would easily meet its goal to retain 6,144 first-term Marines this year.” [Ref 6 and Ref 24] Table 2 compares the number of Zone A SRB “takers” in fiscal year 2001 with “takers” in fiscal year 2000. While Table 3 outlines the SRB “take rate” as a percentage of the first-term population at EAS, note that the event of “taking the SRB” is constrained by the number of Marines and occupations that are offered an SRB.

Overall, Tables 2 and 3 suggest that the lump sum SRB payment method is associated with an increase in confirmed Zone A contracts as a percentage of the EAS population and targeted number of FTAP spaces. For example, Table 2 displays that there were 585 more SRB contracts just in the first two quarters of fiscal year 2001 than in all of fiscal year 2000. Furthermore, the 7.8 percentage point increase in Zone A contracts signed (as a percentage of FTAP targeted number of reenlistments) in fiscal year 2001 as compared to fiscal year 2000 is a full three percentage point increase over the next highest percentage change (between fiscal years 1997-1998 and fiscal years 1998-1999).

Period	FY 01 SRB “Takers”	FY 00 SRB “Takers”
October	1248	506
November	493	660
December	404	287
January	316	159
February	204	137
March	279	233
Subtotal	<b>2944</b>	<b>1982</b>
Quarters 3 and 4	44	377
Total	<b>2988</b>	<b>2359</b>

Table 2. Comparison of Number of SRB ‘Takers.’ Fiscal Years 2000 and 2001.  
Source: [Ref 4]

Table 3 shows that the contract rate in 2001, 13 percent, is considerably higher than the contract rate in previous fiscal years. For example, the average (unweighted) contract rate for fiscal years 1999 and 2000 is 9.65. Thus, the rate in 2001 is 3.35 points higher, which is a difference of nearly 30 percent.

<b>Fiscal Year</b>	<b>EAS Population</b>	<b>FTAP Reenlistment Target</b>	<b>Zone A SRB Contracts</b>	<b>SRB Contracts as % of EAS Population</b>
1996	22,072	4,296	961	4.4
1997	24,000	4,600	1,250	5.2
1998	21,824	4,634	1,513	6.9
1999	23,832	5,472	2,077	8.7
2000	22,294	5,787	2,359	10.6
<b>2001</b>	<b>23,051</b>	<b>6,144</b>	<b>2,988</b>	<b>13.0</b>

Table 3. SRB 'Take Rate' as a Percentage of First-Term EAS Population and FTAP Reenlistment 'Target'.  
Source: [Ref 4]

On July 18, 2001, Marine Lieutenant General Garry Parks (Deputy Commandant for Manpower and Reserve Affairs) stated: “In fiscal year 2001 we successfully initiated lump sum bonus payments increasing the net present value of the incentive and positively influencing highly qualified, yet previously undecided personnel.” [Ref 25:p. 3] The numbers displayed in Tables 2 and 3 suggest that the lump sum SRB program has significantly aided the Marine Corps’ first-term reenlistment and retention situation. There is, however, the inherent risk of drawing a hasty conclusion as to the actual influence that the lump sum SRB program had upon the propensity of a first-term Marine to reenlist. Babbie states that: “Whenever it seems to you that X caused Y, ask yourself if that is necessarily the case. What else could have caused Y?” [Ref 26:p. 79] This concern was summarized by the current Marine Corps’ SRB planner (Major Dave Ross) to the author. That is, “if there’s a need to justify or show the effects of the SRB, regression analysis is the way to go. There are too many other factors that influence the reenlistment decision, and to base “readiness” purely on the SRB would be a mistake.” [Ref 3]

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## **IV. DATA AND MODEL DEVELOPMENT**

### **A. INTRODUCTION**

This chapter discusses the specification of the reenlistment model, describes the data sources and restrictions used for the model, describes the candidate explanatory variables, and discusses the expected effects of the explanatory variables on the reenlistment decision of Zone A Marines. The chapter discusses the construction of the civilian unemployment rate variable and the military-to-civilian pay ratio variable. The chapter details the data utilized in the model. The model estimates the impact of the lump sum SRB payment method, selected personal demographic characteristics, and economic determinants on the reenlistment decisions for Zone A Marines making reenlistment decisions. The analysis will determine the probability that a first-term enlisted member will reenlist in the Marine Corps based on the selected personal characteristics, economic factors, and SRB payment method.

Two major sources of data were used to evaluate the relationship between the selected variables and enlisted Marine reenlistment decisions. The first major source of data was provided by Headquarters, Marine Corps (Manpower and Reserve Affairs) and taken from the Total Force Data Warehouse (TFDW) for fiscal years 1996 through 2001. From the TFDW, data files were created that contained characteristic and transaction data on each Zone A Marine who was within 12 months of their ECC on 1 October of calendar years 1998, 1999, and 2000. Each Marine's final reenlistment status was flagged on 30 September of years 1999, 2000, and 2001 in order to constrain the decision window to each Marine's first year of reenlistment eligibility. The constrained data set consisted of all Zone A Marine enlisted personnel who made a reenlistment decision between 1 October 1998 and 30 September 2001. SRB multiples greater than zero were offered on 1 October of fiscal years 1996 through 2001 to Marines in 240 of the 307 MOSs used by the Marine Corps during this time period. For the purpose of this study, each of the 307 MOSs was categorized into one of thirteen Skill Families for model comparison purposes.



The second major source of data, the March Current Population Survey (CPS), was provided by Dr. Michael Hansen (Center for Naval Analyses) and “is used to provide information on civilian earnings opportunities.” [Ref 12:p. 33] The primary goal of the Current Population Survey is:

the development of statistical data about the civilian labor force. In addition it collects information about each member of the interviewed household, as well as labor-related data for the population aged 15 or over. The Bureau of Census conducts a monthly survey that captures information such as age, race, sex, employment status, family characteristics and marital status. Every year a March survey focuses on one of thirteen standard topics. It is called the demographic supplement. The March supplement captures elements such as hours and weeks worked and money income received in the previous calendar year; and the use of social programs. [Ref 20:pp. 93-94]

A binary logit estimating model was used because the reenlistment decision is a binary outcome. In the logit model the contribution of each independent variable to the reenlistment decision can be measured as a marginal effect (the change in probability of reenlistment given a 1-unit change in the independent variable) of each variable upon the dependent variable. Furthermore, the calculated pay elasticity of reenlistment can be used to determine the percentage change in reenlistment associated with a 1-percent change in the military-to-civilian pay ratio. These results can be used to evaluate and compare the relative effects of a variety of personal characteristics and economic determinants, including the unemployment rate, military and civilian pay, and the SRB program.

## **B. CONCEPTUAL FRAMEWORK**

The focus of this analysis will be on active-duty Zone A enlisted Marines who are at their first reenlistment decision point during fiscal years 1999 through 2001. This approach is somewhat dissimilar to previous studies that have only used data on individuals who are eligible to reenlist. Data and time limitations precluded this study from eliminating Marines from the data who may not have been eligible for reenlistment due to various physical or administrative reasons. Therefore, if person does not reenlist it is impossible to discern whether or not they were administratively eligible to reenlist in the first place. However, if a person actually reenlists, it is safe to assume that the Marine was eligible to reenlist.

Hansen pointed out: “there is no clear consensus on the appropriate measure of ‘reenlistment’ or ‘retention’ in the empirical literature.” [Ref 12:p. 33] A Marine who is at his reenlistment decision point may leave the Marine Corps, sign a reenlistment contract, or extend his contract. For the purpose of this study, reenlistment, not extension, will be the focus of the analysis; Zone A Marines who remained in the Marine Corps beyond the end of their current contract (ECC) without signing a reenlistment contract were eliminated from the primary data file. While the analysis of reenlistment, not extension, is the primary purpose of this study, a secondary data set was developed to analyze the impact of the lump sum payment method on the reenlistment decisions of Marines who stayed beyond their ECC (‘stayers’). Zone A Marines who left the Marine Corps at the end of their current contract were eliminated from the second data file. In estimating the model ‘reenlistment rate’ is defined as the ratio of all Zone A Marines who actually reenlisted to all Zone A Marines who are at their first reenlistment decision point. Likewise, ‘reenlist to stayer rate’ is defined as the ratio of all Zone A Marines who reenlisted to all Marines who remained beyond their original ECC.

For the purposes of this study, ECC date is used as a delimiting point rather than the expiration of active service (EAS) date primarily because of the practical application of manpower policy outlined in the Marine Corps Total Force System Personnel Reporting Instructions Manual (MCTFSPRIM). First, the language of Section 30305.1, MCTFSPRIM suggests that the ECC may be administratively maintained with greater administrative scrutiny than the EAS because the ECC has a direct impact on a Marine’s pay. Section 30305.1 states that, “an expired ECC will suspend computation of leave, pay, allowances, and terminate payment of allotments. ECC logic will automatically stop direct deposit two paydays before the ECC date for first-term Marines.” Furthermore, “voluntary extensions of enlistment will adjust the ECC only after the extension is effected.” Second, focus on the EAS may fail to accurately reflect a reenlistment delimiting point for deployed Marines who are eligible for the SRB. Section 30308.1 of the MCTFSPRIM states, “when the EAS date expires while a Marine is serving on a naval vessel in foreign waters, the Marine may be retained beyond normal EAS for Convenience of the Government until the vessel returns to the continental United States (CONUS).” [Ref 31]

Although several variables that affect the reenlistment decision were identified in the literature review outlined in Chapter II, studies noted the consistent impact of the economic determinants of relative pay, unemployment, and bonuses upon the propensity of enlisted members to reenlist. Therefore, the strategy of this study depends on the development of reliable estimates of military and civilian pay, and civilian unemployment rates.

### **C. UNEMPLOYMENT DATA**

Similar to the strategy used by Hansen, this study uses “state-specific, monthly unemployment rates, where the unemployment rate is that of the state in which the person was residing when first enlisting (defined as a Marine's home-of-record)” in order to “control for economic conditions at the time of the reenlistment decision.” [Ref 12:p. 38] Non-seasonally adjusted unemployment rate figures provided by the Bureau of Labor Statistics were averaged over twelve months for fiscal years 1999 through 2000, and over seven months for fiscal year 2001. “To the extent that people are considering job opportunities ‘back home’ when making a reenlistment decision (a reasonable assumption for those in Zone A), these local unemployment rates reflect the economic environment in which a person is operating at the time of reenlistment.” [Ref 12:p. 38] The range of state-specific unemployment rates during fiscal years 1999 through 2001 was from 2.0 to 6.9 percent (see Appendix A).

### **D. MILITARY-TO-CIVILIAN PAY RATIO AND BONUS MULTIPLES DATA**

Research outlined in Chapter II highlights the importance of estimating the impact of bonuses upon the reenlistment decision by Military Occupational Specialty (MOS). In this analysis, all SRB and compensation information is based on the Marine's Primary Military Occupational Specialty (PMOS). For the purposes of this study all PMOSs were grouped into 13 Skill Families that had clear civilian counterparts. An occupation-specific relative pay ratio was constructed for each Marine by using the annual earnings for the comparable civilian occupations as the denominator, and an individual's base pay (on 1 October of the fiscal year of his first opportunity to reenlist) as the numerator. Each Marine's base pay was a function of his rank and years of service (see Appendix B).

The creation of the Skill Families is based loosely on Eitelberg's (1988) categories of MOS classification composites. The Marine Corps classification composites outlined by Eitelberg are: 1) Combat; 2) Field Artillery; 3) Clerical; 4) Electronics Repair; 5) Mechanical Maintenance; and 6) General Technical. The fundamental principle of grouping PMOSs by similar skills is treated in a Defense Manpower Commission report:

Eligibility for assignment to jobs involving, for instance, mechanical work, was determined by the score a person achieved on a test purportedly predictive of mechanical aptitude. Thus the qualification of individuals for assignments to all occupations in which mechanical work predominated was governed by the score attained on the mechanical aptitude test. Similarly, other occupations characterized by another common and essential type of work such as clerical activities, were grouped together in occupational "clusters" corresponding to the common aptitude required. This practice continues today, although the various aptitude tests have been periodically refined over the years. [Ref 30:p. 69]

Data availability allowed the creation of 13 Skill Families in order to allow for more variability and realism than is offered by the six classification composites mentioned by Eitelberg. At the same time, the number of Skill Families was constrained to 13 to ensure that each Skill Family had at least 50 to 100 separate civilian income observations per year from the Current Population Survey (CPS). [Ref 32]

The multi-part procedure that created the relative pay next created the civilian opportunity pay for each Marine Skill Family. This is based on the CPS data of estimated earnings available to a civilian worker in a comparable civilian occupation to the Marine's PMOS. The Marine's PMOS and its comparable civilian counterpart were linked via the 1997 Department of Defense Occupational Conversion Index (OCI) and the March Current Population Survey. First, in a manner that considered Eitelberg's classification code guidance, each PMOS was placed into a Skill Family. [Ref 30:pp. 230-240 and Ref 32] Then, each PMOS was matched as closely as possible with a comparable civilian occupation title from the OCI. [Ref 33] Hansen referenced the difficulty in matching each PMOS with a comparable civilian occupation title when he noted: "some ratings have clear civilian counterparts, but many do not." Furthermore, "although the OCI matches many ratings (MOSs) to a unique civilian counterpart, some

ratings are matched with more than one civilian occupation." [Ref 12:p. 15] In turn, each comparable civilian occupation title from the OCI was assigned a range of CPS codes. Table 4 details the classification coding for each Skill Family and the CPS codes for the comparable civilian counterpart occupation classifications assigned to each Skill Family. Appendix D lists the comparable civilian counterpart occupations by their CPS codes. Appendix C details the assignment of each PMOS into a specific Skill Family and exhibits the multiples offered to each PMOS during each fiscal year evaluated by this study.

<b><u>SKILL FAMILY (Skill Family Code)</u></b>	<b><u>CPS Code</u></b>	<b><u>SKILL FAMILY (Skill Family Code)</u></b>	<b><u>CPS Code</u></b>
<b><u>Aircraft Maintenance (ACM)</u></b>		<b><u>General Technical (GT)</u></b>	
Aircraft Maintenance	503-549	Signals Intel/Electronic Warfare	226-235
		Auditing, Finance and Accounting	337-344
<b><u>Band (BA)</u></b>	183-198	Data Systems	226-235
		Public Affairs	183-198
<b><u>Clerical (CL)</u></b>		Training and Audio Visual Support	183-198
Operational Communications	344-387	Weather Service	223-235
Auditing, Finance and Accounting	325-344	Printing and Reproduction	734-737
Supply Administration and Ops	359-374	Flight Crew/Loadmaster	875-883
Personnel and Administration	325-344	Computer Equipment Operators	308-319
Legal Services	226-235	College Degree Enlisted	113-154
Training and Audiovisual Support	377-389		
Aircraft Maintenance	377-389	<b><u>Food Service (FOOD)</u></b>	
Airfield Services	303-309	Food Service	433-444
Clerk	377-389		
Transportation	359-374	<b><u>MP/NBC/EOD/Ammo (MP)</u></b>	
Exchange	263-278	Ammunition, EOD and MP	416-427
		Nuclear, Biological and Chemical	416-427
<b><u>Combat (CO)</u></b>	416-427		
		<b><u>Mechanical Maintenance (MM)</u></b>	
<b><u>Electronics Repair (EL)</u></b>		Utilities	534-549
Electronics/Data/Comm Maintenance	523-534	Ordnance	634-655
Avionics	505-549	Engineer, Construction, Equip	703-715
Utilities	505-549	Airfield Services	843-859
Operational Communications	344-353		
		<b><u>Motor Transport (MT)</u></b>	
<b><u>Field Artillery (FA)</u></b>		Motor Transport	505-517
Field Artillery	213-235		
Tank/Amphibian Tractor	843-859		
Anti-Air Warfare	213-235		
		<b><u>Logistics (LOG)</u></b>	
<b><u>Enlisted Navigator/Air Traffic Control (NAV)</u></b>		Logistics	868-883
Enlisted Navigator	226-235		
Air Traffic Control	226-235		

Table 4. Skill Family and Current Population Survey Codes.

Next, for each Skill Family, data was extracted from the CPS for 1999 male full-time, full-year workers who have a high school degree or some college in the 18-24 year-old age group, and who are employed in the civilian occupations that are equivalent to each Skill Family. Finally, the denominator for the relative pay ratio was computed as the median annual income earned by those in the comparable civilian occupations. Civilian income data for the year 2000 was inflated by increasing the 1999 income data by four percent.

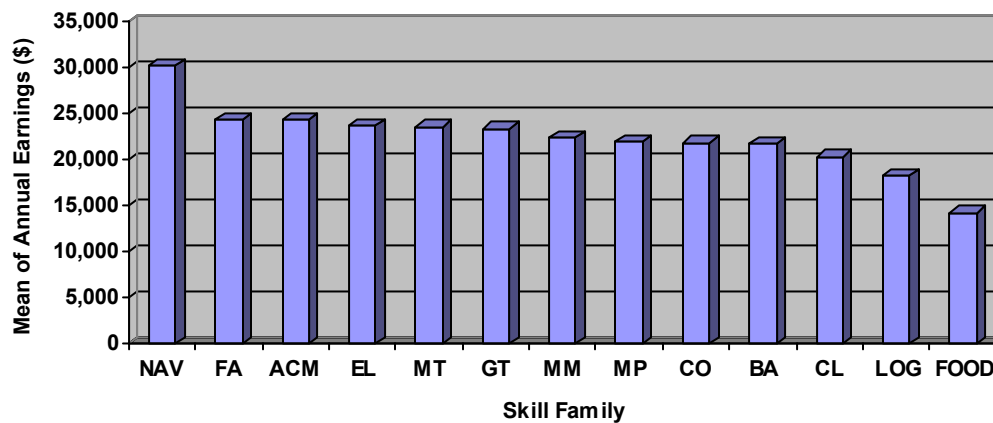


Figure 1. Earnings in Comparable Civilian Occupations (1998-2000).

Figure 1 presents the average of the 1998 through 2000 median civilian earnings computed from the CPS data for enlisted Marines in the 13 Skill Families. Upon examination, Figure 1 reveals a range of civilian earnings across occupations of enlisted Marines who faced their first reenlistment decision during fiscal years 1999 through 2001. The median earnings in comparable civilian occupations ranged from \$14,200 to \$30,200. This variation in earnings “justifies an analysis of the relationship between compensation and reenlistment using occupation-specific estimates of civilian earnings opportunities.” [Ref 12:p. 26]

SRB multiples are essential in creating additional incentives for a Marine to reenlist. Appendix C details, by PMOS, the SRB multiples offered to Zone A eligible Marines in fiscal years 1999 through 2001. Table 5 displays the average SRB multiples offered per Skill Family for fiscal years 1999 through 2001. Evaluation of Figure 1 in

conjunction with Appendix C highlights the incentive created by the SRB. As an illustration, on 1 October 2000 a Corporal with four years of service with PMOS of 0844 (Field Artillery Fire Control Man) would have compared the median comparable civilian income of \$24,334, with his military pay of \$17,967. Appendix C demonstrates that the Corporal would have been offered a lump sum SRB of \$23,956 as an incentive to reenlist (SRB Multiple x Monthly Base Pay x Years of Additional Obligated Service = SRB Amount):  $4 \times \$1497.30 \times 4 = \$23,956.80$ . The bonus would augment his military pay by roughly \$6,000 per year (undiscounted) making his military pay roughly comparable to his civilian earnings potential.

Skill Family	FY 99			FY 00			FY 01		
	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
ACM	1.00	2.02	5.00	1.00	3.39	5.00	0.00	2.17	5.00
BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CL	0.00	.144	0.00	0.00	.189	5.00	0.00	.258	4.00
CO	0.00	.642	3.00	0.00	.590	1.00	0.00	1.03	3.00
EL	0.00	1.45	5.00	0.00	2.25	5.00	0.00	1.82	5.00
FA	0.00	.384	3.00	0.00	1.10	4.00	0.00	1.53	4.00
FOOD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GT	0.00	3.07	5.00	0.00	4.28	5.00	0.00	3.52	5.00
LOG	0.00	.397	1.00	0.00	1.27	4.00	0.00	1.00	2.00
MM	0.00	.285	2.00	0.00	.453	2.00	0.00	.810	3.00
MP	0.00	.430	2.00	0.00	.399	2.00	0.00	.736	2.00
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAV	0.00	2.95	5.00	0.00	1.21	5.00	0.00	3.69	4.00

Table 5. Average SRB Multiples Offered per Skill Family: Fiscal Years 1999-2001.  
Source: [Data file described in Chapter IV. A]

## E. RETENTION MODEL SPECIFICATIONS

The model specifications used in this thesis are categorized by number for easy reference. Table 6 describes each of the model specifications.

### 1. Dependent Variable (Models 1, 2, 5, 6)

The construction of the dichotomous variable (REENLIST) for reenlist/leave requires that the Marine be in Zone A and be facing his first opportunity to reenlist. Reenlist is coded as a '1' if the Marine chooses to reenlist on active duty and coded as '0' if the Marine leaves. Models 1 and 2 use data for the period 1999-2001. Models 5 and 6

use data for the period 1996 through 2001. Marines who remain on active duty beyond their ECC without reenlisting (extendees) are omitted from the data set used for models 1, 2, 5, and 6.

## 2. Dependent Variable (Models 3 and 4)

A variation on the basic models (models 1 and 2) is used in this thesis to analyze the effect of the SRB on channeling stayers into long-term reenlistments. Zone A Marines who left the Marine Corps at the completion of their initial contract were deleted from the data set for models 3 and 4. Retention will be coded as a '1' if the Marine chooses to reenlist on active duty and will be coded as a '0' if the Marine extends.

<u>Model</u>	<u>Table</u>	<u>Description</u>
1A	16	Basic Selective Reenlistment Bonus (SRB) Retention Model, FY99-01
2A	17	Basic Bonus Multiple (MULT) Retention Model, FY99-01
1B	18	Basic SRB Model (with PAYRATIO)
1C	19	Basic SRB Model (with PAYRATIO, and UNEMPLOY)
1D	20	Basic SRB Model (with PAYRATIO, UNEMPLOY, FY00, FY01)
2B	21	Basic MULT Model (with PAYRATIO)
2C	22	Basic MULT Model (with PAYRATIO, and UNEMPLOY)
2D	23	Basic MULT Model (with PAYRATIO, UNEMPLOY, FY00, FY01)
3A	24	Basic SRB Model for Stayers Only
4A	25	Basic MULT Model for Stayers Only
3B	26	Basic SRB Model (with PAYRATIO) for Stayers Only
3C	27	Basic SRB Model (with PAYRATIO, and UNEMPLOY) for Stayers Only
3D	28	Basic SRB Model (with PAYRATIO, UNEMPLOY, FY00, FY01) for Stayers Only
4B	29	Basic MULT Model (with PAYRATIO) for Stayers Only
4C	30	Basic MULT Model (with PAYRATIO, and UNEMPLOY) for Stayers Only
4D	31	Basic MULT Model (with PAYRATIO, UNEMPLOY, FY00, FY01) for Stayers Only
5	32	Basic SRB Model: fiscal years 1996-2001
6	33	Basic MULT Model: fiscal years 1996-2001

Table 6. Description of Models.

## 3. Explanatory Variables

Variables were selected for the retention models based on the literature review in Chapter II and on the availability of data. Each variable is defined below in Table 7. Table 7 presents the names of the explanatory variables, describes their coding, and the expected effect of each on reenlistment.



Table 8 details the military-to-civilian pay ratio per Skill Family for fiscal years 1999 through 2001.

<b><u>Variable Name</u></b>	<b><u>Description</u></b>	<b><u>Expected Effect on Reenlistment</u></b>
<b>FY00</b>	=1 if fiscal year of sample	+
<b>FY01</b>	is noted in variable	+
<b>SRB</b>	=1 if Marine offered an SRB multiple > 0	+
<b>SRB00</b>	=1 if Marine offered an SRB multiple during	?
<b>SRB01</b>	fiscal year noted in variable	?
<b>MULT</b>	=SRB Multiple (0-5)	+
<b>MULT00</b>	=MULT * FY00	?
<b>MULT01</b>	=MULT * FY01	?
<b>UNEMPLOY</b>	= Mean unemployment rate of the sample	+
<b>PAYRATIO</b>	= Mean military-to-civilian pay ratio	+
<b>AFQTHIGH</b>	=1 if >= 50	-
<b>NOTWHITE</b>	=1 if not white	+
<b>FEMALE</b>	=1 if female	+
<b>MARDEP</b>	=1 if married and/or has dependents	+
<b>ZZ_AGE</b>	= Mean age of sample	-

Table 7. Model Explanatory Variables.

*a. Fiscal Year*

A fiscal year control variable will “pick up any effects that are peculiar to the year; these include any changes to attitudes in addition to changes in pay and the civilian unemployment rate.” [Ref 16:p. 18] During fiscal year 2001 the U. S. elected a new president who expressed pro-military opinions. A potential surge of optimism motivated by a pro-military administration may induce Marines to reenlist. Additionally, the Marine Corps’ lump sum SRB payment method was initiated in fiscal year 2001 as an inducement for Marines to reenlist. Therefore, fiscal years 2000 and 2001 (FY00 and FY01) are expected to have a positive effect on reenlistment when compared to fiscal year 1999.

***b. Selective Reenlistment Bonus***

“Basic pay is the largest component of military compensation. The most significant way in which compensation varies across ratings (equivalent to Marine Corps Military Occupational Specialties) is through the payment of selective reenlistment bonuses.” [Ref 12:p. 37] The offer of a SRB is designed to induce Marines to reenlist by offering a positive economic incentive and is expected to have a positive effect on reenlistment. SRB00 and SRB01 are interaction variables constructed by multiplying the dummy variable SRB by the fiscal year dummy variables FY00 and FY01. SRB00 and SRB01 are designed to capture any differential effect that SRBs may have on the reenlistment decision for Marines facing their first reenlistment decision during 2000-2001.

The variable MULT captures the effect of a one-level increase in the bonus multiple offered to the Marine making a reenlistment decision. MULT00 and MULT01 are interaction variables constructed by multiplying the variable MULT with the fiscal year dummy variables FY00 and FY01. MULT00 and MULT01 are designed to capture any differential effect that a one-level increase in the multiple may have on the reenlistment decision for Marines facing their first reenlistment decision during 2000-2001. The overall effect of the SRB01 and MULT01 interactive variables upon reenlistment is expected to be positive due to the switch to the lump sum payment method. However, some have suggested that the offer of a bonus to certain Marines may induce disgruntlement amongst the enlisted force, in which case the bonus would have a negative impact upon reenlistment. [Ref 4] Therefore, the overall effect of the interaction variables on reenlistment is unknown.

***c. Unemployment Rate***

UNEMPLOY represents the unemployment rate at the time the Marine reenlisted in the Marine’s home of record state. It is expected that as unemployment rates increase, reenlistment in the Marine Corps will increase. “With higher unemployment civilian job prospects decline and the security of the reenlistment contract will be more attractive.” [Ref 20:p. 68]

**d. Pay Ratio**

PAYRATIO represents the occupation-specific relative pay ratio that was constructed for each Marine. The pay ratio uses the annual earnings for comparable civilian occupations as the denominator, and an individual's base pay (on 1 October of the year of his first opportunity to reenlist) as the numerator. Each Marine's base pay was a function of his rank and years of service (see Appendix B). Table 8 provides a detailed representation of the pay ratio for this data set, per Skill Family for fiscal years 1999-2001. A pay ratio above 1.0 implies that military pay exceeds civilian pay in comparable occupations, while a pay ratio below 1.0 implies civilian pay exceeds military pay. Only the FOOD Skill Family had a pay ratio greater than 1.0.

	Skill Family												
	NAV	CL	FA	MT	MM	LOG	EL	ACM	GT	MP	CO	BA	FOOD
Pay Ratio	.5501	.6258	.6606	.6721	.6866	.6984	.6987	.6690	.7183	.7299	.7308	.7758	1.108

Table 8. Pay Ratio per Skill Family: Fiscal Years 1999-2001.

**e. Armed Forces Qualification Test**

AFQTHIGH is a proxy variable designed to capture the effect of the Armed Forces Qualification Test score on reenlistment. The AFQT is designed to "measure the *trainability* of potential recruits--more specifically, to identify individuals who are at high risk of not completing the initial training program." [Ref 34:p. 6] At the most fundamental level, the AFQT is a gauge of *aptitude* (a prediction of the in-service performance of applicants) not a measure of *intellectual ability*. [Ref 35:p. 113] As a measure of aptitude, "higher AFQT scores reflect higher trainability and are expected to be negatively related to reenlistment because of expanded civilian opportunities" compared to those Marines that have lower AFQT scores. [Ref 20:p. 67]

**f. Minority Status**

Minority status is represented by a dummy variable coded '1' if the Marine is not white (NOTWHITE) and coded '0' if the Marine is white. The dummy variable FEMALE is coded '1' if the Marine is a female. Civilian earnings opportunities

are perceived to be lower for minorities and females. Therefore, it is hypothesized that minority status and being female will be positively related to reenlistment in the Marine Corps.

***g. Marital and Dependent Status***

MARDEP represents the status of a Marine who is married and/or has dependents. The studies outlined in the literature review identified a greater propensity to reenlist amongst enlisted persons that are married and/or have dependents. Therefore, it is hypothesized that a Marine who is married and/or has dependents will have a greater propensity to reenlist than one who is not married or responsible for dependents.

***h. Age***

ZZ\_AGE is a continuous variable that describes a Marine's age at the reenlistment decision point. Older Marines have families who may grow weary of long periods away from their Marine. Also, older Marines may be more aware of reasonable civilian opportunities than younger Marines. Therefore, age will have a negative effect on reenlistment.

***i. Skill Family***

Each Skill Family variable represents a group of Marine occupational specialties. Table 4 and Appendix C detail the individual Skill Families. North (Reference 28) discovered that most military occupational specialties have higher reenlistment probabilities relative to the military occupational specialty of Infantry. Therefore, it is hypothesized that each Skill Family will have a positive effect on reenlistment.

The basic first-term enlisted Marine personnel reenlistment model specifications are:

**REENLIST = f (SRB, SRB01, AFQTHIGH, NOTWHITE, MARDEP, FEMALE, ZZ\_AGE, ACM, BA, CL, EL, FA, FOOD, GT, LOG, MM, MP, MT, NAV)**

**REENLIST = f (MULT, MULT01, AFQTHIGH, NOTWHITE, MARDEP, FEMALE, ZZ\_AGE, ACM, BA, CL, EL, FA, FOOD, GT, LOG, MM, MP, MT, NAV)**

## F. STATISTICAL MODEL

Each of the Marines in the primary data file either reenlisted or separated from the Marine Corps. Similarly, each of the Marines in the secondary data file either reenlisted or extended on active duty (all ‘leavers’ were omitted from the secondary data file). Thus, each individual is making a choice among discrete alternatives (‘reenlist/leave’, for models 1,2, 5, and 6 or ‘reenlist/extend’, for models 3 and 4) on the basis of his individual characteristics, the economic environment, and the SRB. Therefore, a binomial logit is the functional form of the multivariate model that will be used to examine each Marine’s dichotomous decision. The dependent variable was created as a discrete binary choice where REENLIST = 1 if the Marine’s decision was to reenlist; REENLIST = 0 if the Marine’s decision was to leave. Similarly, the dependent variable for models 3 and 4 was created as a discrete binary choice where REENLIST = 1 if the Marine’s decision was to reenlist; REENLIST = 0 if the Marine’s decision was to extend.

The logistic model relates the decision of the  $i$ th Marine,  $Y_i$ , to a  $k$  dimensional vector of individual characteristics for Marine  $i$ ,  $X_i$ , such that:

$$P(\text{Marine } i \text{ reenlists}) = P(Y_i = 1 | X_i) = \frac{1}{1 + \exp(-\beta X_i)}$$

or

$$\ln \{ [\text{Prob}(Y = 1 | X_i)] / [1 - \text{Prob}(Y = 1 | X_i)] \} = \alpha + \beta X_i = \sum_j \alpha_j + \beta_j X_{ij}$$

where  $P$  is the probability that the  $i^{\text{th}}$  Marine will reenlist, and  $\beta$  is the coefficient vector for each of a Marine’s individual characteristics.  $\beta_j$  may be interpreted as the impact of a change in characteristic  $j$  on the log of the retention odds ratio, holding the other individual characteristics constant. The binomial logit bounds the probability of the decision between zero and one, thus restricting the estimating function to credible values. [Ref 36:p. 442]

The estimating equation is estimated by maximum likelihood techniques using the statistical software *SAS*. The slope of the S-shaped curve, bounded between the values of zero and one, is the partial derivative of the logit function. The partial effect of each

explanatory variable is given by:  $\delta P / \delta X = \beta_i(P)(1-P)$ . When evaluated at the mean of the function, the partial effect varies because the rate of change of the probability with respect to each explanatory variable involves not only  $\beta_i$  but also the level of the probability. Specifically, “the change in the probability associated with a change in one of the X variables will be dependent on the value of that variable and on values of other X variables. The slope of the logit model can be directly interpreted as the change in the log-odds ratio for a unit change in X, namely, it tells how the log-odds in favor of leaving” the Marine Corps can change as say, a Marine is offered an SRB multiple greater than zero. [Ref 20:p. 73 and Ref 16:pp. 17-18]

The logit model estimates a nonlinear relationship between the explanatory variables and the probability of reenlistment. According to Hansen, “the interpretation of the coefficients is not straightforward.” Therefore, “to facilitate an interpretation of the results, the ‘marginal effects’ are calculated using the average derivative.” [Ref 12:p. 40] Marginal effects of the explanatory variables measure the impact of a one-unit change in each variable on the retention probability, holding all other variables constant.

The differences in the retention probability for a Zone A Marine can be computed and compared to the retention probability of a “base-case Zone A Marine” for small changes in the explanatory variables. The base-case individual is used to develop the baseline probability of reenlistment. For this study, the base-case is defined as a single, white, male Lance Corporal of average age in the Skill Family Combat. Since the logit function is nonlinear, the value of the derivative is dependent upon where it is evaluated. The sample case is normally evaluated at the mean value of the continuous variables. [Ref 16:p. 17] For example, a marginal effect for the variable MARDEP (married and/or with dependents) of .08 implies that, for two otherwise identical Marines, the probability of reenlistment is 8 percentage points higher for the married Marine than the Marine who is not married or with dependents. If the average reenlistment rate is 15 percent for a single, Zone A enlisted “base-case Marine” without dependents, an 8 percentage-point increase in the probability of reenlistment is fairly large (about 50 percent higher). [Ref 12:p. 41] The analysis in Chapter V will compute marginal effects for the estimated coefficients in the logit model.

The -2 Log Likelihood statistic is a measure of the goodness-of-fit of the equation. [Ref 16] The -2 Log Likelihood statistic has a chi-square distribution under the null hypothesis (that all the explanatory effects of in the model are zero) and the procedure produces a *p*-value for this statistic. A significant probability value, *p* < .05, indicates that at least one of the coefficients of the explanatory variables is not zero. When the null hypothesis is rejected, it can be concluded that the regression model has some explanatory value. [Ref 37:p. 323 and Ref 20:p. 74] All chi-square values reported below in Chapter V are statistically significant.

**G. DESCRIPTIVE STATISTICS FOR ZONE A REENLISTMENTS: FY 1999 THROUGH 2001**

Table 9 details the reenlistment rates for Marines in the primary data file. Observations that were deleted from the primary dataset included: 1) observations in grades of E0, E1, E2, and E6; 2) Marines with greater than 72 months of active service at their decision-point; 3) Marines with existing extensions in the system; 4) all 'stayers' who did not reenlist; 5) Marines with prior military service (PSEPs) with other branches of the Department of Defense. Note that there were approximately 700 PSEPs during fiscal years 2000 and 2001. [Ref 44] As seen in Table 9, the reenlistment rate increased between fiscal year 1999 and 2001 by 3.9 percentage points, a difference of 17.3 percent.

	# Zone A Decision Pt.	Total Reenlistments	Reenlistment Rate
<b>FY99</b>	20024	4535	22.6
<b>FY00</b>	18892	4692	24.8
<b>FY01</b>	<b>20039</b>	<b>5303</b>	<b>26.5</b>

Table 9. Reenlistment Rates: Fiscal Years 1999-2001.

Table 10 displays the ratio of reenlistments to all stayers. Observations omitted from the data file detailed in Table 10 (and analyzed in models 3 and 4) included: 1) observations in grades of E0, E1, E2, and E6; 2) Marines with greater than 72 months of active service at their decision-point; 3) Marines with existing extensions in the system; 4) all Marines who did not remain on active duty beyond their initial ECC ('leavers'); 5)

Marines with prior military service (PSEPs) with other branches of the Department of Defense. Table 10 notes that while the ratio of reenlistments to all stayers decreased by .3 percentage points between FY99 and FY00, the ratio increased 5.6 percentage points (or 7.2 percent) between FY00 and FY01.

	<b># Zone A Stayers</b>	<b>Total Reenlistments</b>	<b>Ratio Reenlistments To All Stayers</b>
<b>FY99</b>	5799	4535	78.2
<b>FY00</b>	6023	4692	77.9
<b>FY01</b>	<b>6351</b>	<b>5303</b>	<b>83.5</b>

Table 10. Ratio Reenlistments to All Stayers: Fiscal Years 1999-2001.

Tables 11 through 15 detail the characteristics of all Marines in the primary data file in the years 1999-2001. Table 11 gives the overall average reenlistment rate, and the reenlistment rates by SRB multiple for fiscal years 1999 through 2000, immediately prior to the execution of the Marine Corps' lump sum SRB payment policy.

<b><u>Characteristic</u></b>	<b><u># Zone A Decision Pt.</u></b>	<b><u>Percent of Sample</u></b>	<b><u>Total # of Reenlistments</u></b>	<b><u>Reenlistment Rate (%)</u></b>	<b><u>Difference* (%pt.)</u></b>
<b><u>Overall Average</u></b>	38916	100	9227	23.7	
<b><u>SRB Multiple Offered</u></b>					
None	21563	55.4	4927	22.8	Base
Multiple > 0	17353	44.6	4300	24.8	+ 1.9
Multiple 1	10692	27.5	2301	21.5	- 1.3
Multiple 2	2291	5.9	649	28.3	+ 5.5
Multiple 3	1325	3.4	392	29.6	+ 6.7
Multiple 4	1468	3.8	463	31.5	+ 8.7
Multiple 5	1577	4.1	495	31.4	+ 8.5

\* Difference in Reenlistment Rate: The difference in reenlistment rate compared to "Base Case":

Table 11. Reenlistment Rate by Multiple Offered to Marines Making Zone A Reenlistment Decisions: Fiscal Years 1999-2000.

Table 11 shows that there were 9,227 reenlistments and 29,689 separations (an average reenlistment rate of 23.7) amongst Marines making first-term reenlistment decisions in the 1999-2000 period. As seen in column 2 of Table 11, 44.6 percent of the



Marines making their first reenlistment decision during the pre-lump sum policy period were offered an SRB; 27.5 percent were offered a level-one bonus, 5.9 percent were offered a level-two bonus, 3.4 percent a level-three bonus, 3.8 percent a level-four bonus, and 4.1 percent a level-five bonus. The impact of the SRB on reenlistment rates in FY99-FY00 detailed in Table 11 is not unexpected: the reenlistment rate is 1.9 percentage points higher for those offered a SRB (see column 5). Furthermore, the greatest impact of the SRB on the decision to reenlist is for Marines offered level-four and level-five multiples.

Table 12 details the overall reenlistment rate, and the reenlistment rates by SRB multiple of the data for 2001, the first year of the lump sum SRB payment policy. There were 5,303 reenlistments and 14,736 separations (an average reenlistment rate of 26.5%) amongst Marines making first-term reenlistment decisions during fiscal year 2001. The overall reenlistment rate in 2001 is 2.8 points higher than the rate in the pre-lump sum period, 1999-2000.

<u>Characteristic</u>	<u># Zone A Decision Pt.</u>	<u>Percent of Sample</u>	<u>Total # of Reenlistments</u>	<u>Reenlistment Rate (%)</u>	<u>Difference* (%pt.)</u>	<u>Delta ** Reenlist Rate</u>
<b><u>Overall Average</u></b>	20039	100	5303	26.5		+ 2.8
<b><u>SRB Multiple Offered</u></b>						
None	8973	44.8	2445	27.2	Base	+ 4.4
Multiple > 0	11066	55.2	2858	25.8	- 1.4	+ 1.0
Multiple 1	6356	31.7	1412	22.2	- 5.0	+ 0.7
Multiple 2	1581	7.9	415	26.2	- 1.0	- 2.1
Multiple 3	1200	6.0	413	34.4	+ 7.2	+ 4.8
Multiple 4	1266	6.3	415	32.8	+ 5.5	+ 1.2
Multiple 5	663	3.3	203	30.6	+ 3.4	- 0.8
* Difference in Reenlistment Rate: The difference in reenlistment rate compared to "Base Case":						
** Difference in reenlistment rate compared to FY 99-00 data						

Table 12. Reenlistment Rate by Multiple Offered to Marines Making Zone A Reenlistment Decisions: Fiscal Year 2001.

During fiscal year 2001, 55.2 percent of the Marines making their first reenlistment decision were offered an SRB; of these, 31.7 percent were offered a level-one bonus, 7.9 percent were offered a level-two bonus, 6.0 percent a level-three bonus, 6.3 percent a level-four bonus, and 3.3 percent a level-five bonus.

The impact of the SRB during fiscal year 2001 is complicated. Table 12 (column 6) reveals that the reenlistment rates decreased for Marines offered SRB multiples of two and five (compared to FY99-00). While the average reenlistment rate during FY01 is 1.4 percentage points lower for Marines offered any SRB (compared to those not offered a SRB multiple in 2001), the reenlistment rate for Marines offered any SRB is 1-percentage point higher in FY01 than FY99-FY00. The average reenlistment rate is 5.0 percentage points lower and 1.0 percentage points lower for Marines offered multiples of one and two, respectively (compared to Marines not offered a SRB multiple in 2001), while the reenlistment rates for level-four and five multiples are markedly lower than the reenlistment rates for a level-three multiple. The greatest impact of the SRB on the decision to reenlist is for Marines offered a level-three multiple.

Tables 13 and 14 detail demographic characteristics of the sample before and after the change in the SRB payment policy. Tables 13 and 14 detail the percentage of the sample represented by each characteristic, the reenlistment rate for each demographic characteristic, and the difference in the reenlistment rate between the base-case and each characteristic. Additionally, Table 14 (column 6) displays the difference in reenlistment rates 2001 and 1999-2000.

As expected, Table 13 displays that Marines in higher grades are more likely to reenlist. As seen in Table 13 (column 4), while only 11.7 percent of Lance Corporals reenlisted during FY99-FY00, 24.7 percent of Corporals and 33.6 percent of Sergeants reenlisted.

The next three categories of variables listed in Table 13 summarize the relationships between marital status, gender, race, and retention. The results generally support findings of the studies outlined in Chapter II. The reenlistment rate of women is 4.1 percentage points higher than the rate for men. Reenlistment rates of Marines are sharply delineated by marital/dependency status and race. That is, Marines who are married and/or have dependents are 10.7 percentage points more likely to reenlist than those who are not married nor have dependents, and non-white Marines are 37 percent more likely to reenlist than whites.

Table 13, column 4, shows the reenlistment rates for Marines in the AFQT categories used in this study. Generally, high AFQT scorers (categories I and II) are slightly less likely than other Marines to reenlist. cursory evaluation of the relationship between AFQT test score categories and the reenlistment/leave decision reveals results that are not unexpected: the FY99-FY00 reenlistment rate for category I Marines is a full percentage point lower than the base case.

<u>Characteristic</u>	<u># Zone A Decision Pt.</u>	<u>Percent of Sample</u>	<u>Total # of Reenlistments</u>	<u>Reenlistment Rate (%)</u>	<u>Difference* (% pt.)</u>
<b><u>Overall Average</u></b>	38916	100	9227	23.7	
<b><u>Grade</u></b>					
LCPL	7785	20.0	914	11.7	Base
CPL	24019	61.7	5923	24.7	+ 12.9
SGT	7112	18.3	2390	33.6	+ 21.9
<b><u>Marital/Dependency Status</u></b>					
Not Married and/or Depend	21295	54.7	4016	18.9	Base
Married and/or Dependents	17621	45.3	5211	29.6	+ 10.7
<b><u>Gender</u></b>					
Male	36886	94.8	8667	23.5	Base
Female	2030	5.2	560	27.6	+ 4.1
<b><u>Race</u></b>					
White	28578	73.4	6170	21.6	Base
Not White	10338	26.6	3057	29.6	+ 8.0
<b><u>AFQT Score</u></b>					
AFQT I	1430	3.7	328	22.9	- 1.0
AFQT II	14414	37.0	3382	23.5	- 0.5
AFQT IIIa	10601	27.2	2531	23.9	-0.1
AFQT LOW	12447	32.0	2978	23.9	Base
<b><u>Skill Family</u></b>					
Aircraft Maintenance	2111	5.4	671	31.8	+ 15.3
Band	248	0.6	69	27.8	+ 11.4
Clerical	5409	13.9	1606	29.7	+ 13.2
Electronics Repair	5447	14.0	1402	25.7	+ 9.3
Field Artillery	1962	5.0	373	19.0	+ 2.5
Food Service	902	2.3	224	24.8	+ 8.4
General Technical	1432	3.7	367	25.6	+ 9.2
Logistics	1304	3.4	392	30.1	+ 13.6
Mechanical Maintenance	4805	12.3	1157	24.1	+ 7.6
MP/NBC/EOD/AMMO	2756	7.1	624	22.6	+ 6.2
Motor Transport	3855	9.9	857	22.2	+ 5.8
Navigator/Air Traffic Control	326	0.8	109	33.4	+ 17.0
Combat	8359	21.5	1376	16.5	Base
* Difference in Reenlistment Rate = The difference in reenlistment rate compared to "Base Case."					

Table 13. Reenlistment Rate by Characteristics of Marines Making Zone A Reenlistment Decisions: Fiscal Years 1999-2000.

Table 13 displays that while the lowest reenlistment rates during FY99-00 are associated with Marines from infantry, artillery, military police, and motor transport-related occupations, reenlistees are more likely to be from aviation-support, logistical, and clerical occupations. Specifically, while Marines in Field Artillery are 2.5 percentage points more likely to reenlist than infantry Marines, Marines in Navigator/Air Traffic Control and Aircraft Maintenance are 17 and 15.3 percentage points, respectively more likely to reenlist than infantry Marines.

<u>Characteristic</u>	<u># Zone A Decision Pt.</u>	<u>Percent of Sample</u>	<u>Total # of Reenlistments</u>	<u>Reenlistment Rate (%)</u>	<u>Difference* (% pt.)</u>	<u>Delta ** Reenlist Rate</u>
<b><u>Overall Average</u></b>	20039	100	5303	26.5		+ 2.8
<b><u>Grade</u></b>						
LCPL	4654	23.2	696	15.0	Base	+ 3.2
CPL	12274	61.3	3467	28.2	+ 13.3	+ 3.6
SGT	3111	15.5	1140	36.6	+ 21.7	+ 3.0
<b><u>Marital/Dependency Status</u></b>						
Not Married and/or Depend	11331	56.5	2475	21.8	Base	+ 3.0
Married and/or Dependents	8708	43.5	2828	32.5	+ 10.6	+ 2.9
<b><u>Gender</u></b>						
Male	18779	93.7	4930	26.3	Base	+ 2.8
Female	1260	6.3	373	29.6	+ 3.4	+ 2.0
<b><u>Race</u></b>						
White	14174	70.7	3407	24.0	Base	+ 2.4
Not White	5865	29.3	1896	32.3	+ 8.3	+ 2.8
<b><u>AFQT Score</u></b>						
AFQT I	705	3.5	186	26.4	+ 0.0	+ 3.4
AFQT II	6838	34.1	1775	26.0	- 0.4	+ 2.5
AFQT IIIa	5606	28.0	1524	27.2	+ 0.9	+ 3.3
AFQT LOW	6881	34.3	1812	26.3	Base	+ 2.4
<b><u>Skill Family</u></b>						
Aircraft Maintenance	1087	5.4	363	33.4	+ 14.2	+ 1.6
Band	123	0.6	38	30.9	+ 11.7	+ 3.1
Clerical	3142	15.7	1022	32.5	+ 13.3	+ 2.8
Electronics Repair	3050	15.2	828	27.1	+ 7.9	+ 1.4
Field Artillery	907	4.5	264	29.1	+ 9.9	+ 10.1
Food Service	444	2.2	110	24.8	+ 5.5	- 0.1
General Technical	944	4.7	293	31.0	+ 11.8	+ 5.4
Logistics	542	2.7	166	30.6	+ 11.4	+ 0.6
Mechanical Maintenance	2588	12.9	636	24.6	+ 5.3	+ 0.5
MP/NBC/EOD/AMMO	1235	6.2	309	25.0	+ 5.8	+ 2.4
Motor Transport	1825	9.1	448	24.5	+ 5.3	+ 2.3
Navigator/Air Traffic Control	176	0.9	61	34.7	+ 15.4	+ 1.2
Combat	3976	19.8	765	19.2	Base	+ 2.8
* Difference in Reenlistment Rate = The difference in reenlistment rate compared to "Base Case."						
** Difference in reenlistment rate compared to FY 99-00 data						

Table 14. Reenlistment Rate by Characteristics of Marines Making Zone A Reenlistment Decisions: Fiscal Year 2001.

The results detailed in Table 14 note that during FY01 Marines in higher grades are more likely to reenlist. As seen in column 4, while only 15.0 percent of Lance Corporals reenlisted during FY01, 28.2 percent of Corporals and 36.6 percent of Sergeants reenlisted. Furthermore, column 6 highlights that the reenlistment rates during fiscal year 2001 increased by 3.2 percentage points for Lance Corporals, 3.6 percentage points for Corporals and 3.0 percentage points for Sergeants (compared to FY99-00).

Note that the data in Table 14 (column 6) show that reenlistment rates during FY01 increased by the same magnitude for married and non-married Marines when compared to FY99-00. Closer analysis of the effect on reenlistment in FY01 reveals a narrowing difference in reenlistment rates between high AFQT scorers and Marines who scored below 50 percent on the AFQT; the FY01 reenlistment rates for category I Marines were a full percentage point higher than the base case.

Other differences in reenlistment rates include higher rates for females and non-whites. Comparison of reenlistment rates displayed in column 4 of Tables 13 and 14 reveal that rates increased over time for all gender and race categories. That is, while the female reenlistment rate during FY99-FY00 was 27.6 percent, the rate for women Marines was 29.6 percent during FY01. Furthermore, while the reenlistment rate for non-white Marines during FY99-FY00 was 29.6 percentage points, the rate for non-white Marines was 32.3 percent in FY01.

Differences in reenlistment rates between Skill Families are detailed in column 6 of Table 14. Marines who reenlisted during FY01 are less likely to be from infantry, food service, motor transport, and mechanical maintenance occupations, and more likely to be from aviation-support, general technical, and clerical occupations. The greatest increase in reenlistment rates between the non-lump sum payment period and FY01 is in the Field Artillery and General Technical Skill Families. That is, the reenlistment rates were 10.1 percentage points and 5.4 percentage points higher in FY01 (compared to FY99-00) for Field Artillery and General Technical, respectively. The average (unweighted) increase in reenlistment rates amongst all Skill Families was 2.6 percentage points.

Table 15 presents tabulated annual reenlistment rates per Skill Family by bonus multiple. The rates in each column of Table 15 are the quotient of the number of Marines, per Skill Family, per fiscal year, who reenlisted divided by the number of Marines, per Skill Family, per fiscal year, who were offered the multiple listed in the column. As an illustration, while 46 Marines in FY01 (in NAV) were targeted with a level-2 bonus, only 11 reenlisted, for a reenlistment rate of 23.9 percent. A bonus was not offered in cells marked 'n.a.' Evaluation of Table 15 in conjunction with Table 14 augments the details provided in this chapter. Table 15 shows that reenlistment rates during FY01 in four Skill Families (Clerical, Combat, Electronics Repair, and General Technical) are markedly higher for Marines offered relatively low SRB multiples. For example, a Marine in the Skill Family GT (during FY01) was 5.4 points less likely to reenlist when offered a level-5 bonus than a Marine offered a level-4 bonus.

It is noteworthy that Table 14 shows that Marines in the Combat Skill Family account for 19.8 percent of the sample. While 36.7 percent of Marines (in Combat) offered a multiple of three reenlisted, 100 percent reenlisted who were not offered a SRB multiple. A similar pattern of reenlistment rates is noted for Clerical (15.7 percent of the sample), Electronics Repair (15.2 percent of the sample), and General Technical (4.7 percent of the sample). For example, while 28.4 percent of the Marines (in General Technical) offered a multiple of five reenlisted, 30.2 percent and 33.3 percent reenlisted who were offered multiples of one and zero, respectively. Table 15 reveals a marked increase in reenlistment rates (between FY00 and FY01) at three SRB multiple levels for Marines in Field Artillery. That is, reenlistment rates increased from 15.2 to 100 percent, 21.4 to 27.1 percent, and 25.0 to 35.9 percent for artillery Marines offered multiples of zero, one, and three, respectively.

Skill Family	FY	SRB Multiple					
		<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
ACM	99	n.a.	25.1	28.5	41.0	40.2	36.4
	00	n.a.	31.3	27.0	26.7	40.3	39.7
	01	33.9	40.0	28.8	34.5	33.8	40.7
BA	99	26.2	n.a.	n.a.	n.a.	n.a.	n.a.
	00	29.4	n.a.	n.a.	n.a.	n.a.	n.a.
	01	30.9	n.a.	n.a.	n.a.	n.a.	n.a.
CL	99	28.3	35.1	41.1	n.a.	n.a.	n.a.
	00	29.8	31.1	32.3	n.a.	n.a.	50.0
	01	31.5	36.9	40.6	44.0	34.5	n.a.
CO	99	14.8	16.5	n.a.	27.3	n.a.	n.a.
	00	17.1	16.8	n.a.	n.a.	n.a.	n.a.
	01	100.0	19.0	n.a.	36.7	n.a.	n.a.
EL	99	20.5	27.9	26.3	25.1	28.0	25.9
	00	19.0	26.5	22.5	26.4	37.9	28.6
	01	25.0	29.0	24.1	32.4	29.8	31.4
FA	99	16.2	16.0	50.0	26.1	n.a.	n.a.
	00	15.2	21.4	n.a.	25.0	38.2	n.a.
	01	100.0	27.1	n.a.	35.9	38.2	n.a.
FOOD	99	22.4	n.a.	n.a.	n.a.	n.a.	n.a.
	00	27.6	n.a.	n.a.	n.a.	n.a.	n.a.
	01	24.8	n.a.	n.a.	n.a.	n.a.	n.a.

Skill Family	FY	SRB Multiple					
		<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
GT	99	20.0	23.1	19.8	25.0	17.4	35.4
	00	66.7	n.a.	23.6	37.8	26.7	28.8
	01	33.3	30.2	16.3	35.4	33.8	28.4
LOG	99	26.4	30.1	n.a.	n.a.	n.a.	n.a.
	00	31.9	24.2	34.5	n.a.	38.5	n.a.
	01	35.3	30.3	26.5	n.a.	n.a.	n.a.
MM	99	23.8	23.6	23.9	18.9	n.a.	n.a.
	00	23.0	27.2	26.9	n.a.	n.a.	n.a.
	01	23.8	25.7	23.9	30.3	n.a.	n.a.
MP	99	20.6	20.4	28.8	n.a.	n.a.	n.a.
	00	21.8	28.5	39.0	n.a.	n.a.	n.a.
	01	25.0	23.9	29.1	n.a.	n.a.	n.a.
MT	99	21.0	n.a.	n.a.	n.a.	n.a.	n.a.
	00	23.4	n.a.	n.a.	n.a.	n.a.	n.a.
	01	24.6	n.a.	n.a.	n.a.	n.a.	n.a.
NAV	99	15.0	n.a.	24.6	n.a.	37.5	38.9
	00	40.2	n.a.	25.8	n.a.	n.a.	34.6
	01	n.a.	n.a.	23.9	n.a.	39.1	n.a.

Note: n. a. = No bonus offered

Table 15. Zone A Reenlistment Rates per Skill Family by Multiple: Fiscal Years 1999-2001.

While tabulations of reenlistment rates by different characteristics of Marines making reenlistment decisions can provide considerable insight into the factors associated with the reenlistment decision, they can also obscure relationships important to Marine Corps planners. That is, Table 15 is based on tabulations and thus gives unusual results. Specifically, as the multiple level increases, reenlistment rates decrease for various Skill Families in particular years. To obtain valid estimates of the effects of particular variables on the reenlistment decision, a multivariate model must be estimated. Only in such a model can confounding effects be statistically separated. [Ref 16:p. 17]

## **V. LOGIT MODEL RESULTS**

### **A. RETENTION MODELS (MODELS 1 AND 2)**

#### **1. Basic Retention Models (Models 1A and 2A)**

Tables 16 and 17 show the results of the basic retention models. The effect of the selective reenlistment bonus is consistent with expectations. The marginal effect in Table 16 shows that a Marine offered a SRB is 3.2 percentage points more likely to reenlist than one who is not offered a SRB. Table 17 shows that a one-level increase in the SRB multiple increases the propensity of a Marine to reenlist by 1.9 percentage points. Tables 16 and 17 suggest that the impact of the lump sum bonus offered in FY01 appears to be larger than the partial installment bonus offered in FY99 and FY00. Table 16 shows that the impact of being offered a SRB increased by 2.6 percentage points between fiscal years 1999-2000 and 2001. Similarly, in Table 17 the impact of a one-level increase in the SRB multiple increased the probability of reenlistment by .7 percentage points between fiscal years 1999-2000 and 2001.

The effects of variables AFQTHIGH, NOTWHITE, and MARDEP were consistent with expectations. The variable AFQTHIGH (see Tables 16 and 17) had a negative impact upon a Marine's likelihood to reenlist. A Marine who scores above the 50<sup>th</sup> percentile on the AFQT is .6 to .9 percentage points less likely to reenlist. Models 1A and 2A indicated a significant, positive relationship between race and the propensity to reenlist. Holding all other variables constant, a non-white Marine has a 6.9 to 7.1-percentage point higher propensity to reenlist. Similarly, a Marine who is married and/or has dependents is 10.2 percentage-points more likely to reenlist than one who has neither a spouse nor children.

The variables FEMALE and ZZ\_AGE produced unexpected signs. Perhaps this is due to the small number of females in the data set. However, further analysis of Table 14 (Chapter IV) reveals that the greatest increase in reenlistment rates by SRB multiple took place in the Skill Family Field Artillery; this Skill Family is manned solely by men. A one-year increase in a Marine's age has a negligible effect upon the probability to reenlist.



The Skill Family variables produced a wide range of marginal effects. Models 1A and 2A reveal that Marines in all Skill Families are more likely to reenlist than those in infantry. When the model controls for SRB, Marines in field artillery, motor transport, and military police occupations have the lowest marginal effects and air traffic controllers, band members, and aircraft maintenance personnel have the highest marginal effects (see Table 16). However, when the model controls for the SRB multiple, Marines in field artillery, motor transport, and general technical have the lowest marginal effects and band members, air traffic controllers, and clerical Marines have the highest marginal effects (see Table 17).

## **2. Basic Retention Models with PAYRATIO, UNEMPLOY, FY00, FY01 Variables (Models 1B, 1C, 1D, 2B, 2C, 2D)**

Results of estimating the various specifications of models 1 and 2 are shown in Tables 18 through 23. The marginal effects listed in Tables 18 through 23 show that a Marine offered a SRB is 2.4 to 2.9 percentage points more likely to reenlist than one who is not offered a SRB. Further, a one-level increase in the SRB multiple increases the propensity of a Marine to reenlist by 1.4 to 1.7 percentage points. The impact of the lump sum bonus appears to vary in significance as controls for unemployment, the relative pay ratio, and the fiscal years are added to models 1B, 1C, and 1D. This is not unexpected, given that it may be that models 1B, 1C, 1D, 2B, 2C, and 2D cannot distinguish between a general increase in retention in FY01 and the increase in retention due to switching to a lump sum payment method. [Ref 43] Another way to state this is that the effects changes in SRB01 and MULT01 may be matched exactly by the relative changes over time of other variables (i.e., FY00, FY01, UNEMPLOY, and PAYRATIO). The estimation procedure may be incapable of distinguishing the effects of these time-varying variables, thus causing problems for estimation. [Ref 36:p. 90-91] The mixing of pay and bonus variables in the specification may bias the effect of the bonus. Further, the marginal effects of SRB01 and MULT01 (in models 1D and 2D) are relatively small. Thus, the results of models 1D and 2D (see Tables 20 and 23) are questionable.

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
SRB	.4820	.1712	.027***	0.032
SRB00	.1528	X	X	X
SRB01	.1877	.1286	.029***	0.058
UNEMPLOY	4.1503	X	X	X
PAYRATIO <sup>b</sup>	.7317	X	X	X
AFQTHIGH	.6720	-.0310	.022	-0.006
NOTWHITE	.2748	.3591	.022***	0.069
MARDEP	.4466	.5299	.020***	0.102
FEMALE	.0558	-.0851	.041**	-0.016
ZZ_AGE	22.754	.0091	.005*	0.002
ACM	.0542	.7452	.046***	0.138
BA	.0063	.8571	.121***	0.159
CL	.1450	.7183	.038***	0.133
EL	.1441	.4818	.036***	0.089
FA	.0487	.2628	.052***	0.049
FOOD	.0228	.4388	.071***	0.081
GT	.0403	.5565	.053***	0.103
LOG	.0313	.6523	.057***	0.121
MM	.1254	.4407	.038***	0.082
MP	.0677	.4051	.046***	0.075
MT	.0963	.3970	.044***	0.074
NAV	.0085	.8685	.099***	0.161
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-2.200		
ADJ R SQ.		.0467		
N		58922		
CHI SQ		1881.3***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 16. Basic Selective Reenlistment Bonus (SRB) Retention Model: FY99-01 (Model 1A).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
MULT	.9245	.1015	.011***	0.019
MULT00	.3158	X	X	X
MULT01	.3646	.0320	.012***	0.026
UNEMPLOY	4.1503	X	X	X
PAYRATIO <sup>b</sup>	.7317	X	X	X
AFQTHIGH	.6720	-.0485	.022**	-0.009
NOTWHITE	.2748	.3701	.022***	0.071
MARDEP	.4466	.5294	.020***	0.102
FEMALE	.0558	-.0782	.041*	-0.015
ZZ_AGE	22.754	.0068	.005	0.001
ACM	.0542	.5791	.049***	0.107
BA	.0063	.7812	.119***	0.145
CL	.1450	.6342	.035***	0.118
EL	.1441	.3257	.037***	0.060
FA	.0487	.2081	.052***	0.039
FOOD	.0228	.3479	.069***	0.065
GT	.0403	.2886	.059***	0.054
LOG	.0313	.5957	.057***	0.110
MM	.1254	.3825	.037***	0.071
MP	.0677	.3666	.045***	0.068
MT	.0963	.3086	.041***	0.057
NAV	.0085	.6498	.101***	0.121
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-2.0567		
ADJ R SQ.		.0480		
N		58922		
CHI SQ		1934.0***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 17. Basic Multiple (MULT) Retention Model: FY99-01 (Model 2A).

The coefficient on the military-to-civilian pay ratio is positive and statistically significant (see Tables 18 through 23). It is difficult to translate either the coefficient or marginal effect of relative pay into a relationship between changes in pay and the propensity to reenlist. [Ref 12:p. 42] Therefore, Tables 18 through 23 calculate the effect of PAYRATIO as the elasticity. Pay elasticity is defined as the percentage change in reenlistment associated with a 1-percent change in the military-to-civilian pay ratio. An elasticity of 2.8 (the marginal effect of PAYRATIO) implies that the responsiveness of Marine Corps reenlistment to changes in the ratio of military-to-civilian pay is well in line with prior studies. [Ref 16:p. 23] That is, all things being equal, a 1-percent increase in the relative pay ratio is related to a 2.8-percent increase in the reenlistment rate.

The effects of variables AFQTHIGH, ZZ\_AGE, NOTWHITE, and MARDEP were consistent with expectations. The variables AFQTHIGH and ZZ\_AGE (see Tables 18 through 23) had significant, negative impacts upon a Marine's likelihood to reenlist. Tables 18 through 23 show that a Marine who scores above the 50<sup>th</sup> percentile on the AFQT is 1.4 to 1.7 percentage points less likely to reenlist. A one-year increase in a Marine's age has a negligible effect upon the probability to reenlist. The models detailed in Tables 18 through 23 indicated a significant, positive relationship between race and the propensity to reenlist. Holding all other variables constant, a non-white Marine has a 7.3 to 7.5-percentage point higher propensity to reenlist. Similarly, a Marine who is married and/or has dependents is 10.2 percentage-points more likely to reenlist than one who has neither a spouse nor children.

The variable UNEMPLOY produced an unexpected sign. Contrary to expectations, models 1C, 2C, 1D, and 2D indicated a negative relationship between the unemployment rate and the propensity to reenlist. The marginal effect of (-.004) suggests that an increase in the unemployment rate from 4.15-percent to 5.15-percent would be associated with a very minor decrease in the average reenlistment rate. This is counterintuitive, but represents a relatively negligible effect. Although the unemployment rate varies by year, it is constant within a year, thus making it collinear with other fiscal year variables.

A woman is 1.7 percentage points less likely to reenlist than a man. This result is unexpected. Perhaps this is due to the small number of females in the data set. However, it was pointed out earlier that the greatest increase in reenlistment rates by SRB multiple took place in the Skill Families Combat and Field Artillery, which are manned solely by Marine Corps men.

The Skill Family variables produced a wide range of marginal effects that varied significantly when the model controlled for relative pay. That is, while models 1A and 2A reveal that Marines in all of the Skill Families are more likely to reenlist than a Marine in the Skill Family CO, models 1B, 2B, 1C, 2C, 1D, and 2D reveal that Marines in the Skill Families Food and Logistics are less likely to reenlist than a Marine in the Skill Family Combat. A Marine in the Skill Family Food is approximately 29 percentage points less likely to reenlist than the omitted, base-case (Combat). Perhaps this could be attributed to two significant policy factors. First, in FY99 the food service MOS was downsized. While Marines retained their food service designation, 549 were re-assigned to various occupational specialties. Second, food service Marines were not offered a bonus during FY99-01. A logistics Marine is 2.4 percentage points less likely to reenlist than the base-case.

Overall, reenlistment behavior is consistent with the SRB multiples offered during fiscal years 1999 through 2001. When the model controls relative compensation, Marines in the Skill Families offered the highest average multiples are more likely to reenlist than Marines in other Skill Families. Specifically, Marines in the Skill Families NAV, ACM, EL, and GT were offered average SRB multiples of 2.6, 2.51, 1.8, and 3.6, respectively during fiscal years 1999 through 2001 (see Chapter IV, Table 5). As an illustration, the variable NAV produced the highest marginal effect of all the Skill Families. This is counterintuitive. Of all the Skill Families, Marines in the Skill Family NAV have the highest civilian earnings (with a military-to-civilian pay ratio of .5501). However, the average multiples recorded in Table 5 suggest that this is associated with the relatively high average SRB multiples offered per fiscal year (2.95, 1.21, and 3.69 in FY99, FY00, and FY01, respectively).

The variables ACM, EL, and GT produced expected results. Table 5 pointed out that these three Skill Families were offered three of the four highest average SRB multiples for each of the fiscal years evaluated. Tables 18 through 23 reveal that Marines in aircraft maintenance, electronics maintenance, and general technical specialties are 8.8 to 17.7 percentage points more likely to reenlist than Marines in the Skill Family CO. However, a Marine in the motor transportation specialty was not offered a multiple during FY99-01, yet is 7.1 to 11.9 percentage points more likely to reenlist than the omitted, base-case (Combat).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
SRB	.4820	.1268	.028***	0.024
SRB00	.1528	X	X	X
SRB01	.1877	.0264	.029	0.030
UNEMPLOY	4.1503	X	X	X
PAYRATIO <sup>b</sup>	.7317	5.108	.185***	2.818
AFQTHIGH	.6720	-.0762	.023***	-0.015
NOTWHITE	.2748	.3768	.022***	0.073
MARDEP	.4466	.5265	.020***	0.102
FEMALE	.0558	-.0902	.042**	-0.017
ZZ_AGE	22.754	-.0132	.005***	-0.003
ACM	.0542	.9561	.047***	0.177
BA	.0063	.5786	.124***	0.107
CL	.1450	.4406	.040***	0.082
EL	.1441	.6586	.036***	0.122
FA	.0487	.6131	.053***	0.114
FOOD	.0228	-1.559	.102***	-0.289
GT	.0403	.6603	.054***	0.122
LOG	.0313	-.1242	.065*	-0.023
MM	.1254	.5059	.038***	0.094
MP	.0677	.4068	.046***	0.075
MT	.0963	.6402	.046***	0.119
NAV	.0085	1.830	.106***	0.339
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.3661		
ADJ R SQ.		.0657		
N		58922		
CHI SQ		2662.2***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO				

Table 18. Basic SRB Model (with PAYRATIO) (Model 1B).

<u>Variable</u>	<u>Mean</u>	$\beta$	Standard <u>Error</u>	Marginal <u>Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
SRB	.4820	.1278	.028***	0.024
SRB00	.1528	X	X	X
SRB01	.1877	.0197	.029	0.029
UNEMPLOY	4.1503	-.0273	.012**	-0.005
PAYRATIO <sup>b</sup>	.7317	5.099	.185***	2.813
AFQTHIGH	.6720	-.0746	.023***	-0.014
NOTWHITE	.2748	.3839	.023***	0.074
MARDEP	.4466	.5274	.020***	0.102
FEMALE	.0558	-.0910	.042**	-0.018
ZZ_AGE	22.754	-.0133	.005***	-0.003
ACM	.0542	.9545	.047***	0.177
BA	.0063	.5794	.124***	0.107
CL	.1450	.4393	.040***	0.081
EL	.1441	.6569	.036***	0.122
FA	.0487	.6141	.054***	0.114
FOOD	.0228	-1.557	.102***	-0.289
GT	.0403	.6589	.054***	0.122
LOG	.0313	-.1244	.065*	-0.023
MM	.1254	.5060	.038***	0.094
MP	.0677	.4068	.046***	0.075
MT	.0963	.6386	.046***	0.118
NAV	.0085	1.827	.106***	0.339
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.2475		
ADJ R SQ.		.0658		
N		58922		
CHI SQ		2667.6***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 19. Basic SRB Model (with PAYRATIO, and UNEMPLOY) (Model 1C).



<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	.0032	.025	0.001
FY01	.3399	.1063	.032***	0.021
SRB	.4820	.1582	.029***	0.029
SRB00	.1528	X	X	X
SRB01	.1877	-.0859	.042**	0.014
UNEMPLOY	4.1503	-.0220	.012*	-0.004
PAYRATIO <sup>b</sup>	.7317	5.099	.187***	2.813
AFQTHIGH	.6720	-.0711	.023***	-0.014
NOTWHITE	.2748	.3805	.023***	0.073
MARDEP	.4466	.5282	.020***	0.102
FEMALE	.0558	-.0945	.042**	-0.018
ZZ_AGE	22.754	-.0131	.005**	-0.003
ACM	.0542	.9391	.047***	0.174
BA	.0063	.5697	.123***	0.106
CL	.1450	.4252	.040***	0.079
EL	.1441	.6404	.037***	0.119
FA	.0487	.6170	.054***	0.114
FOOD	.0228	-1.569	.102***	-0.291
GT	.0403	.6519	.054***	0.121
LOG	.0313	-.1293	.065**	-0.024
MM	.1254	.4991	.038***	0.093
MP	.0677	.4013	.046***	0.074
MT	.0963	.6292	.046***	0.117
NAV	.0085	1.826	.106***	0.339
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.3004		
ADJ R SQ.		.0661		
N		58922		
CHI SQ		2679.7***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 20. Basic SRB Model (with PAYRATIO, UNEMPLOY, FY00, FY01) (Model 1D).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
MULT	.9245	.0702	.011***	0.013
MULT00	.3158	X	X	X
MULT01	.3646	.0178	.012	0.017
UNEMPLOY	4.1503	X	X	X
PAYRATIO <sup>b</sup>	.7317	5.034	.184***	2.777
AFQTHIGH	.6720	-.0879	.023***	-0.017
NOTWHITE	.2748	.3839	.022***	0.074
MARDEP	.4466	.5270	.020***	0.102
FEMALE	.0558	-.0859	.042**	-0.017
ZZ_AGE	22.754	-.0145	.005***	-0.003
ACM	.0542	.8438	.050***	0.157
BA	.0063	.5423	.122***	0.101
CL	.1450	.3965	.036***	0.074
EL	.1441	.5561	.038***	0.103
FA	.0487	.5695	.054***	0.106
FOOD	.0228	-1.581	.099***	-0.293
GT	.0403	.4798	.060***	0.089
LOG	.0313	-.1477	.064**	-0.027
MM	.1254	.4708	.037***	0.087
MP	.0677	.3850	.046***	0.071
MT	.0963	.5870	.042***	0.109
NAV	.0085	1.668	.108***	0.309
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.2332		
ADJ R SQ.		.0666		
N		58922		
CHI SQ		2698.7***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 21. Basic MULT Model (with PAYRATIO) (Model 2B).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	X	X	X
FY01	.3399	X	X	X
MULT	.9245	.0704	.011***	0.013
MULT00	.3158	X	X	X
MULT01	.3646	.0158	.012	0.017
UNEMPLOY	4.1503	-.0258	.012**	-0.005
PAYRATIO <sup>b</sup>	.7317	5.022	.184***	2.771
AFQTHIGH	.6720	-.0862	.023***	-0.017
NOTWHITE	.2748	.3906	.023***	0.075
MARDEP	.4466	.5279	.020***	0.102
FEMALE	.0558	-.0867	.042**	-0.017
ZZ_AGE	22.754	-.0145	.005***	-0.003
ACM	.0542	.8432	.050***	0.156
BA	.0063	.5441	.122***	0.101
CL	.1450	.3962	.036***	0.073
EL	.1441	.5557	.038***	0.103
FA	.0487	.5704	.054***	0.106
FOOD	.0228	-1.577	.099***	-0.293
GT	.0403	.4798	.060***	0.089
LOG	.0313	-.1469	.064**	-0.027
MM	.1254	.4715	.037***	0.087
MP	.0677	.3854	.046***	0.071
MT	.0963	.5863	.042***	0.109
NAV	.0085	1.666	.108***	0.309
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.1202		
ADJ R SQ.		.0667		
N		58922		
CHI SQ		2703.5***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO				

Table 22. Basic MULT Model (with PAYRATIO, and UNEMPLOY) (Model 2C).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3204	-.0100	.025	-0.002
FY01	.3399	.0616	.029**	0.012
MULT	.9245	.0782	.011***	0.015
MULT00	.3158	X	X	X
MULT01	.3646	-.0069	.015	0.014
UNEMPLOY	4.1503	-.0222	.012*	-0.004
PAYRATIO <sup>b</sup>	.7317	4.997	.186***	2.757
AFQTHIGH	.6720	-.0840	.023***	-0.016
NOTWHITE	.2748	.3882	.023***	0.075
MARDEP	.4466	.5287	.020***	0.102
FEMALE	.0558	-.0884	.042**	-0.017
ZZ_AGE	22.754	-.0143	.005***	-0.003
ACM	.0542	.8369	.050***	0.155
BA	.0063	.5453	.122***	0.101
CL	.1450	.3951	.036***	0.073
EL	.1441	.5523	.038***	0.102
FA	.0487	.5705	.054***	0.106
FOOD	.0228	-1.568	.099***	-0.291
GT	.0403	.4767	.060***	0.088
LOG	.0313	-.1425	.065**	-0.026
MM	.1254	.4717	.037***	0.087
MP	.0677	.3849	.046***	0.071
MT	.0963	.5855	.043***	0.109
NAV	.0085	1.668	.108***	0.309
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
CONSTANT		-5.1387		
ADJ R SQ.		.0668		
N		58922		
CHI SQ		2710.2***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 23. Basic MULT Model (with PAYRATIO, UNEMPLOY, FY00, FY01) (Model 2D).

## **B. STAYER-ONLY RETENTION MODELS (MODELS 3 AND 4)**

A separate analysis was undertaken to analyze the effect of the SRB on channeling stayers (Marines who remained beyond their ECC) into long-term reenlistments. The analysis detailed in models 3 and 4 restricted the sample to Marines who reenlisted or extended. The results of the various specifications of models 3 and 4 are shown in Tables 24 through 31.

### **1. Stayer-Only Basic Retention Models (Models 3A and 4A)**

The basic findings for models 3A and 4A are remarkably close to those highlighted in models 1A and 2A. That is, while a stayer offered a SRB is 2.5 percentage points more likely to reenlist (than extend) than a stayer who is not offered a SRB, a one-level increase in the SRB multiple increases the propensity of a ‘stayer’ to reenlist by 1.5 percentage points. Models 3A and 4A suggest that the impact of the lump sum bonus offered in FY01 appears to be larger than the partial installment bonus offered in FY99 and FY00. Specifically, a stayer offered a lump sum SRB is 5.5 percentage points more likely to reenlist than a Marine offered an installment bonus in FY99-FY00. Thus, the impact of the SRB on a stayer’s reenlistment decision increased by 3.0 percentage points between fiscal years 1999 and 2001. Similarly, the impact of a one-level increase in the SRB multiple increased by .8 percentage points between fiscal years 1999 and 2001.

The effects of variables AFQTHIGH, NOTWHITE, and MARDEP were consistent with expectations. The variable AFQTHIGH (see Tables 24 and 25) had negative impacts upon a Marine’s relative probability of reenlisting versus extending. A Marine who scores above the 50<sup>th</sup> percentile on the AFQT is 1.2 to 1.5 percentage points less likely to reenlist.

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
SRB	.4846	.1578	.053***	0.025
SRB00	.1584	X	X	X
SRB01	.1907	.2382	.059***	0.055
UNEMPLOY	4.154	X	X	X
PAYRATIO <sup>b</sup>	.7439	X	X	X
AFQTHIGH	.6707	-.0758	.043*	-0.012
NOTWHITE	.3332	.1638	.044***	0.026
MARDEP	.5102	.8392	.040***	0.134
FEMALE	.0632	-.1188	.081	-0.019
ZZ_AGE	22.787	.0659	.010***	0.011
ACM	.0672	.6418	.093***	0.103
BA	.0069	1.022	.259***	0.164
CL	.1836	.3869	.070***	0.062
EL	.1455	.7286	.070***	0.117
FA	.0443	.3523	.098***	0.056
FOOD	.0232	.4482	.135***	0.072
GT	.0438	.6139	.106***	0.098
LOG	.0368	.6710	.115***	0.107
MM	.1214	.5722	.072***	0.092
MP	.0641	.4732	.088***	0.076
MT	.0894	.5455	.084***	0.087
NAV	.0103	1.378	.261***	0.220
FY01 Reenlist to Stayers Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-1.0419		
ADJ R SQ.		.0705		
N		18157		
CHI SQ		829.4***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 24. Basic SRB Model for Stayers Only (Model 3A).

<u>Variable</u>	<u>Mean</u>	<u><math>\beta</math></u>	<u>Standard Error</u>	<u>Marginal Effect<sup>a</sup></u>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
MULT	1.004	.0908	.022***	0.015
MULT00	.3553	X	X	X
MULT01	.3994	.0781	.026***	0.023
UNEMPLOY	4.154	X	X	X
PAYRATIO <sup>b</sup>	.7439	X	X	X
AFQTHIGH	.6707	-.0917	.043**	-0.015
NOTWHITE	.3332	.1739	.044***	0.028
MARDEP	.5102	.8377	.040***	0.134
FEMALE	.0632	-.1120	.081	-0.018
ZZ_AGE	22.787	.0636	.010***	0.010
ACM	.0672	.4648	.098***	0.074
BA	.0069	.9308	.257***	0.149
CL	.1836	.2906	.064***	0.046
EL	.1455	.5722	.072***	0.092
FA	.0443	.3014	.098***	0.048
FOOD	.0232	.3448	.132***	0.055
GT	.0438	.3385	.118***	0.054
LOG	.0368	.6081	.115***	0.097
MM	.1214	.5034	.070***	0.081
MP	.0641	.4251	.087***	0.068
MT	.0894	.4441	.078***	0.071
NAV	.0103	1.160	.263***	0.186
FY01 Reenlist to Stayer Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-.8864		
ADJ R SQ.		.0708		
N		18157		
CHI SQ		832.7***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO				

Table 25. Basic MULT Model for Stayers Only (Model 4A).

Models 3A and 4A indicated a significant, positive relationship between race and the propensity to reenlist. However, the impact was markedly lower for stayers compared to the sample in models 1A and 2A. Holding all other variables constant, a non-white stayer has a 2.6 to 2.8-percentage point higher probability of reenlisting versus extending. That is, while a non-white Marine is approximately 7.0 percentage points more likely to reenlist (than leave active duty) than a white Marine, the same non-white Marine is less than half as likely to reenlist than extend. Similarly, a Marine who is married and/or has dependents is 13.4 percentage points more likely to reenlist (than extend) than one who has neither a spouse nor children. Another way to state this is that a stayer who is married and/or has dependents is 30 percent more likely to reenlist (when offered the choice to reenlist or extend) than when he has the choice to reenlist or leave active duty (compared to a stayer who has neither a spouse nor children). The results suggest that a Marine who is white or has family commitments is more likely to reenlist (versus extend) than a stayer who is not white or is without family obligations.

The variables FEMALE and ZZ\_AGE produced unexpected signs. A Marine Corps woman is approximately 2.0 percentage points less likely to reenlist (than extend) than a man. Perhaps the sign change for the variable FEMALE is due to the small number of females in the data set. A one-year increase in a Marine's age has a significant, positive effect upon the probability of a stayer to reenlist.

The Skill Family variables produced a wide range of marginal effects. Models 3A and 4A reveal that Marines in all Skill Families are more likely to reenlist (than extend) than an infantry Marine. When the model controls for SRB, Marines in field artillery, clerical, and food service occupations have the lowest marginal effects, and air traffic controllers, band members, and logistics personnel have the highest marginal effects (see Table 24). However, when the model controls for the SRB multiple, Marines in field artillery, clerical, and general technical have the lowest marginal effects, and air traffic controllers, band members, and logistics Marines have the highest marginal effects (see Table 25).



**2. Stayer-Only Basic Retention Models with PAYRATIO, UNEMPLOY, FY00, FY01 Variables (Models 3B, 3C, 3D, 4B, 4C, 4D)**

Results of estimating the various specifications of models 3 and 4 are shown in Tables 26 through 31. The marginal effects listed in Tables 26 through 31 show that a Marine offered a SRB is 2.2 to 4.2 percentage points more likely to reenlist (than extend) than one who is not offered a SRB. Further, Tables 26 and 27 show that a one-level increase in the SRB multiple increases the relative probability of reenlisting versus extending by .5 to 1.8 percentage points. While the variables SRB01 and MULT01 are significant in models 26 through 31, the effect of the lump sum bonus appears to change from positive to negative as controls for fiscal years are added to models 3D and 4D (see Tables 28 and 31). Note that the marginal effects of SRB01 and MULT01 (in models 3D and 4D) are relatively small. Therefore, a sign change is not too surprising.

The coefficient on the military-to-civilian pay ratio is positive and statistically significant in Tables 26 through 31. Tables 26 through 31 reveal that all things being equal, a 1-percent increase in the pay ratio is related to a .46 to .52-percent increase in the relative reenlistment rate.

The effects of variables AFQTHIGH, ZZ\_AGE, NOTWHITE, and MARDEP were consistent with models 3A and 4A. Tables 26 through 31 show that a Marine who scores above the 50<sup>th</sup> percentile on the AFQT is 1.4 to 1.8 percentage points less likely to reenlist than extend. A one-year increase in a Marine's age has a significant, positive effect upon the probability to reenlist (versus extend). The model indicated a significant, positive relationship between race and the propensity to reenlist. Holding all other variables constant, a non-white Marine has a 2.9 to 3.2-percent higher relative probability of reenlisting versus extending. Similarly, a Marine who is married and/or has dependents is 13.5 percentage-points more likely to reenlist (versus extend) than one who has neither a spouse nor children.

The variable UNEMPLOY produced an unexpected sign. Similar to models 1C, 2C, 1D, and 2D, models listed in Tables 26 through 31 indicated a negative relationship between the unemployment rate and the propensity to reenlist. The marginal effect of (-.007) suggests that an increase in the unemployment rate from 4.15-percent to 5.15-

percent would be associated with a very minor decrease in the average reenlistment rate. Note that this is a relatively negligible effect.

A woman is 2.0 to 2.3 percentage points less likely to reenlist (than extend) than a man. This result is unexpected, however it is consistent with all models that have been mentioned earlier.

The Skill Family variables produced a wide range of marginal effects that varied significantly when the model controlled for relative pay and unemployment. That is, while models 3A and 4A reveal that Marines in all of the Skill Families are more likely to reenlist than an infantry Marine, models 3B, 3C, 3D, 4B, 4C, and 4D reveal that only Marines in the Skill Family Food are less likely to reenlist (versus extend) than a Marine in the Skill Family Combat. Tables 26 through 31 show that a Marine in the Skill Family Food is approximately 14.5 to 16.1 percentage points less likely to reenlist (versus extend) than the omitted, base-case (Combat).

<u>Variable</u>	<u>Mean</u>	<u><math>\beta</math></u>	<u>Standard Error</u>	<u>Marginal Effect<sup>a</sup></u>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
SRB	.4846	.1380	.053***	0.022
SRB00	.1584	X	X	X
SRB01	.1907	.1466	.060**	0.039
UNEMPLOY	4.154	X	X	X
PAYRATIO <sup>b</sup>	.7439	3.423	.374***	0.509
AFQTHIGH	.6707	-.101	.043**	-0.016
NOTWHITE	.3332	.1755	.044***	0.028
MARDEP	.5102	.8430	.040***	0.135
FEMALE	.0632	-.1297	.081	-0.021
ZZ_AGE	22.787	.0503	.010***	0.008
ACM	.0672	.7823	.094***	0.125
BA	.0069	.8800	.261***	0.141
CL	.1836	.1832	.073**	0.029
EL	.1455	.8429	.071***	0.135
FA	.0443	.5877	.102***	0.094
FOOD	.0232	-.9179	.201***	-0.147
GT	.0438	.7364	.108***	0.118
LOG	.0368	.1718	.127	0.027
MM	.1214	.6124	.072***	0.098
MP	.0641	.4679	.088***	0.075
MT	.0894	.6982	.086***	0.112
NAV	.0103	2.029	.271***	0.325
FY01 Reenlist to Stayers Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-3.1633		
ADJ R SQ.		.0776		
N		18157		
CHI SQ		914.9***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 26. Stayer Basic SRB Model (with PAYRATIO) for Stayers Only (Model 3B).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
SRB	.4846	.1408	.053***	0.023
SRB00	.1584	X	X	X
SRB01	.1907	.1357	.060***	0.038
UNEMPLOY	4.154	-.0593	.023**	-0.009
PAYRATIO <sup>b</sup>	.7439	3.374	.374***	0.502
AFQTHIGH	.6707	-.099	.043**	-0.016
NOTWHITE	.3332	.1895	.044***	0.030
MARDEP	.5102	.8442	.040***	0.135
FEMALE	.0632	-.1310	.082	-0.021
ZZ_AGE	22.787	.0505	.010***	0.008
ACM	.0672	.7803	.094***	0.125
BA	.0069	.8785	.261***	0.141
CL	.1836	.1822	.073**	0.029
EL	.1455	.8378	.071***	0.134
FA	.0443	.5886	.102***	0.094
FOOD	.0232	-.9051	.201***	-0.145
GT	.0438	.7308	.108***	0.117
LOG	.0368	.1766	.127	0.028
MM	.1214	.6120	.072***	0.098
MP	.0641	.4681	.088***	0.075
MT	.0894	.6903	.086***	0.110
NAV	.0103	2.018	.271***	0.323
FY01 Reenlist to Stayers Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-2.8879		
ADJ R SQ.		.0782		
N		18157		
CHI SQ		921.6***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO				

Table 27. Stayer Basic SRB Model (with PAYRATIO, and UNEMPLOY) for Stayers Only (Model 3C).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
FY00	.3314	-.0891	.048*	-0.015
FY01	.3495	.4391	.067***	0.060
SRB	.4846	.2614	.055***	0.042
SRB00	.1584	X	X	X
SRB01	.1907	-.3592	.086***	-0.013
UNEMPLOY	4.154	-.0422	.023*	-0.007
PAYRATIO <sup>b</sup>	.7439	3.454	.384***	0.514
AFQTHIGH	.6707	-.0900	.043**	-0.014
NOTWHITE	.3332	.1807	.044***	0.029
MARDEP	.5102	.8486	.040***	0.136
FEMALE	.0632	-.1456	.082*	-0.023
ZZ_AGE	22.787	.0509	.010**	0.008
ACM	.0672	.7150	.095**	0.114
BA	.0069	.8113	.262**	0.130
CL	.1836	.1109	.074	0.018
EL	.1455	.7648	.072***	0.122
FA	.0443	.6040	.102***	0.097
FOOD	.0232	-.9759	.204***	-0.156
GT	.0438	.7103	.108***	0.114
LOG	.0368	.1504	.128	0.024
MM	.1214	.5733	.073***	0.092
MP	.0641	.4480	.088***	0.072
MT	.0894	.6508	.087***	0.104
NAV	.0103	2.039	.272***	0.326
FY01 Reenlist to Stayers Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-3.0733		
ADJ R SQ.		.0838		
N		18157		
CHI SQ		989.5***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 28. Stayer Basic SRB Model (with PAYRATIO, UNEMPLOY, FY00, FY01) for Stayers Only (Model 3D).

<u>Variable</u>	<u>Mean</u>	<u><math>\beta</math></u>	<u>Standard Error</u>	<u>Marginal Effect<sup>a</sup></u>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
MULT	1.004	.0753	.022***	0.012
MULT00	.3553	X	X	X
MULT01	.3994	.0574	.026**	0.018
UNEMPLOY	4.154	X	X	X
PAYRATIO <sup>b</sup>	.7439	3.463	.370***	0.515
AFQTHIGH	.6707	-.1145	.043***	-0.018
NOTWHITE	.3332	.1837	.044***	0.029
MARDEP	.5102	.8424	.040***	0.135
FEMALE	.0632	-.1245	.082	-0.020
ZZ_AGE	22.787	.0483	.010***	0.008
ACM	.0672	.6490	.100***	0.104
BA	.0069	.8136	.259***	0.130
CL	.1836	.1108	.067*	0.018
EL	.1455	.7263	.074***	0.116
FA	.0443	.5479	.102***	0.088
FOOD	.0232	-1.009	.195***	-0.161
GT	.0438	.5127	.121***	0.082
LOG	.0368	.1209	.126	0.019
MM	.1214	.5634	.071***	0.090
MP	.0641	.4329	.087***	0.069
MT	.0894	.6265	.081***	0.100
NAV	.0103	1.860	.274***	0.298
FY01 Reenlist to Stayer Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-3.0718		
ADJ R SQ.		.0782		
N		18157		
CHI SQ		921.9***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 29. Stayer Basic MULT Model (with PAYRATIO) for Stayers Only (Model 4B).

<u>Variable</u>	<u>Mean</u>	$\beta$	Standard <u>Error</u>	Marginal <u>Effect</u> <sup>a</sup>
FY00	.3314	X	X	X
FY01	.3495	X	X	X
MULT	1.004	.0758	.022***	0.012
MULT00	.3553	X	X	X
MULT01	.3994	.0535	.026**	0.018
UNEMPLOY	4.154	-.0589	.023**	-0.009
PAYRATIO <sup>b</sup>	.7439	3.409	.370***	0.507
AFQTHIGH	.6707	-.1116	.043***	-0.018
NOTWHITE	.3332	.1974	.044***	0.032
MARDEP	.5102	.8437	.040***	0.135
FEMALE	.0632	-.1259	.082	-0.020
ZZ_AGE	22.787	.0485	.010***	0.008
ACM	.0672	.6487	.100***	0.104
BA	.0069	.8126	.259***	0.130
CL	.1836	.1107	.067*	0.018
EL	.1455	.7230	.074***	0.116
FA	.0443	.5487	.102***	0.088
FOOD	.0232	-.9936	.196***	-0.159
GT	.0438	.5095	.121***	0.082
LOG	.0368	.1273	.126	0.020
MM	.1214	.564	.071***	0.090
MP	.0641	.4335	.087***	0.069
MT	.0894	.6189	.081***	0.099
NAV	.0103	1.850	.274***	0.296
FY01 Reenlist to Stayer Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-2.7959		
ADJ R SQ.		.0788		
N		18157		
CHI SQ		928.5***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO				

Table 30. Stayer Basic MULT Model (with PAYRATIO, and UNEMPLOY) for Stayers Only (Model 4C).

<u>Variable</u>	<u>Mean</u>	<u><math>\beta</math></u>	<u>Standard Error</u>	<u>Marginal Effect<sup>a</sup></u>
FY00	.3314	-.1032	.048**	-0.018
FY01	.3495	.3354	.058***	0.046
MULT	1.004	.1226	.024***	0.020
MULT00	.3553	X	X	X
MULT01	.3994	-.0889	.032***	0.005
UNEMPLOY	4.154	-.0431	.023*	-0.007
PAYRATIO <sup>b</sup>	.7439	3.255	.381***	0.484
AFQTHIGH	.6707	-.1030	.044**	-0.016
NOTWHITE	.3332	.1871	.044***	0.030
MARDEP	.5102	.8491	.040***	0.136
FEMALE	.0632	-.1385	.082*	-0.022
ZZ_AGE	22.787	.0497	.010***	0.008
ACM	.0672	.5997	.101***	0.096
BA	.0069	.8076	.259***	0.129
CL	.1836	.1030	.067	0.016
EL	.1455	.6979	.074***	0.112
FA	.0443	.5390	.102***	0.086
FOOD	.0232	-.9240	.199***	-0.148
GT	.0438	.4944	.121***	0.079
LOG	.0368	.1567	.127	0.025
MM	.1214	.5568	.071***	0.089
MP	.0641	.4368	.087***	0.070
MT	.0894	.6173	.081***	0.099
NAV	.0103	1.861	.274***	0.298
FY01 Reenlist to Stayer Rate			.835	
FY00 Reenlist to Stayer Rate			.779	
CONSTANT		-2.8373		
ADJ R SQ.		.0838		
N		18157		
CHI SQ		990***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				
(b) Marginal Effect for PAYRATIO measures the percent change in the reenlistment rate given a 1-percent increase in basic pay. (Pay Elasticity). B*X*(1-P). P=Reenlistment Rate. X=Mean of PAYRATIO.				

Table 31. Stayer Basic MULT Model (with PAYRATIO, UNEMPLOY, FY00, FY01) for Stayers Only (Model 4D).



### **C. RETENTION MODELS FOR FISCAL YEARS 1996 THROUGH 2001 (MODELS 5 AND 6)**

Data availability allowed for the estimation of models of enlisted Marine retention for a longer period, fiscal years 1996 through 2001. This is done to determine whether results might be affected by the period selected for the control group. The results of models 5 and 6 are shown in Tables 32 and 33. The effect of the selective reenlistment bonus, compared to the results using the 1999-2001 data is markedly larger. Table 32 shows that a Marine offered a SRB during FY96-01 is 4.6 percentage points more likely to reenlist than one who is not offered a SRB. Table 33 shows that a one-level increase in the SRB multiple increases the propensity of a Marine to reenlist by 2.6 percentage points. The interaction coefficients for models 5 and 6 are positive. Further, Table 32 suggests that the impact of the lump sum bonus offered in FY01 appears to be larger than the partial installment bonus offered in FY96 (the impact of the SRB increased by 2.7 percentage points between fiscal years 1996 and 2001). The impact of a one-level increase in the SRB multiple increased by .5 percentage points between fiscal years 1996 and 2001.

The significance of variables AFQTHIGH and FEMALE are questionable. Note that Tables 32 and 33 show that the marginal effect for AFQTHIGH and FEMALE are extremely small. Tables 32 and 33 show that the results for variables ZZ\_AGE, NOTWHITE, and MARDEP are consistent with expectations. A one-year increase in a Marine's age has a negligible effect upon the probability to reenlist. The models indicated a relationship between race and the propensity to reenlist that was similar to models 1 and 2. Holding all other variables constant, the fact that a Marine is not white is related to a 7.4 to 7.6-percentage point increase in his propensity to reenlist. Similarly, a Marine who is married and/or has dependents is 10.5 percentage-points more likely to reenlist than one who has neither a spouse nor children.

The variable BA produced the largest effect amongst the Skill Family variables. A Marine in the Skill Family Band is approximately 18 percentage points more likely to reenlist than the omitted base-case (Combat). Similar to models 1 and 2, Tables 32 and 33 show that Marines in the Skill Families NAV, ACM, GT, CL, and LOG are 5.5 to 13.6 percentage points more likely to reenlist than infantry Marines. However, a Marine

in the Skill Family Field Artillery is only 4.7 to 5.3 percentage points more likely to reenlist than an infantry Marine. Table 33 shows that the marginal effect for all Skill Families are smaller than the marginal effects listed in Table 32.

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
SRB	.3603	.2534	.084***	0.046
SRB01	.0947	.1203	.026***	0.073
AFQTHIGH	.6874	.0255	.016	0.005
NOTWHITE	.2550	.4113	.016***	0.074
MARDEP	.4612	.5851	.014***	0.105
FEMALE	.0462	-.0022	.032	0.000
ZZ_AGE	22.761	.0174	.004***	0.003
ACM	.0588	.6468	.034***	0.116
BA	.0055	1.029	.089***	0.185
CL	.1425	.7538	.026***	0.136
EL	.1403	.4610	.026***	0.083
FA	.0486	.2927	.038***	0.053
FOOD	.0246	.5022	.048***	0.090
GT	.0346	.5807	.041***	0.104
LOG	.0306	.6873	.041***	0.124
MM	.1245	.4306	.027***	0.077
MP	.0662	.3827	.033***	0.069
MT	.0971	.4034	.030***	0.073
NAV	.0088	.6576	.072***	0.118
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
FY99 Reenlistment Rate			.227	
FY98 Reenlistment Rate			.224	
FY97 Reenlistment Rate			.218	
FY96 Reenlistment Rate			.228	
CONSTANT		-2.5365		
ADJ R SQ.		.0570		
N		116,812		
CHI SQ		4505.0***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				

Table 32. Basic SRB Model: Fiscal Years 1996-2001 (Model 5).

<u>Variable</u>	<u>Mean</u>	$\beta$	<u>Standard Error</u>	<u>Marginal Effect</u> <sup>a</sup>
MULT	.7055	.1432	.008***	0.026
MULT01	.1839	.0174	.011*	0.031
AFQTHIGH	.6874	.0064	.016	0.001
NOTWHITE	.2550	.4210	.016***	0.076
MARDEP	.4612	.5849	.014***	0.105
FEMALE	.0462	.0017	.032	0.000
ZZ_AGE	22.761	.0149	.004***	0.003
ACM	.0588	.5224	.035***	0.094
BA	.0055	.9773	.089***	0.176
CL	.1425	.6982	.025***	0.126
EL	.1403	.3307	.027***	0.059
FA	.0486	.2610	.037***	0.047
FOOD	.0246	.4360	.048***	0.078
GT	.0346	.3045	.045***	0.055
LOG	.0306	.6592	.041***	0.119
MM	.1245	.3991	.027***	0.072
MP	.0662	.3637	.033***	0.065
MT	.0971	.3455	.029***	0.062
NAV	.0088	.4657	.074***	0.084
FY01 Reenlistment Rate			.265	
FY00 Reenlistment Rate			.248	
FY99 Reenlistment Rate			.227	
FY98 Reenlistment Rate			.224	
FY97 Reenlistment Rate			.218	
FY96 Reenlistment Rate			.228	
CONSTANT		-2.4113		
ADJ R SQ.		.0586		
N		116,812		
CHI SQ		4637.7***		
*** Significant at .01 level of significance.				
** Significant at .05 level of significance.				
* Significant at .10 level of significance.				
(a) Marginal Effect measures the percentage point change in the reenlistment rate given a 1-unit change in the explanatory variable. B*P*(1-P). P=Reenlistment Rate. B=Coefficient.				

Table 33. Basic MULT Model: Fiscal Years 1996-2001 (Model 6).

## **VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH**

### **A. SUMMARY**

Several findings emerged from this study of the effect of the United States Marine Corps' Lump Sum Selective Reenlistment Bonus Program (SRB) on reenlistment decisions of first-term enlisted Marines. Major results of statistical analyses include the following:

- The basic models using data for 1999-2001 revealed that retention rates increased as a result of changing the SRB payment method to lump sum. The relationship between SRBs and reenlistment rates was found to be positive and significant. A Marine who is offered a SRB is 2.4 to 3.2 percentage points more likely to reenlist than one who is not offered a SRB. The basic models found that the impact of the lump sum bonus offered in FY01 appears to be larger than the partial installment bonus offered in FY00 and FY99. A Marine offered a lump sum SRB is 5.8 percentage points more likely to reenlist than a Marine offered a partial installment bonus in FY99-FY00. Additionally, a one-multiple SRB increase during FY01 is related to a reenlistment rate increase of 2.6 percentage points (compared to FY99-FY00). Thus, the impact of the SRB increased by 2.6 percentage points between fiscal years 1999-2000 and 2001. Further, the impact of the lump sum bonus increased the ratio of reenlisters to total stayers by 1.5 to 3.0 percentage points between fiscal years 1999-2000 and 2001.
- Models that used data for fiscal years 1996 through 2001 determined that the effect of the selective reenlistment bonus, compared to the results using the 1999-2001 data, is markedly larger. The relationship between SRBs and reenlistment rates was found to be positive and significant. A Marine who is offered a SRB during FY96-FY01 is 4.6 percentage points more likely to reenlist than one who is not offered a SRB. Model 5 (Table 32) found that the impact of the lump sum bonus offered in FY01 appears to be larger than the partial installment bonus offered in FY96-FY00. A Marine offered a lump sum SRB is 7.3 percentage points more likely to reenlist than a Marine offered a partial installment bonus in FY96-FY00. Additionally, a one-multiple SRB increase during FY01 is related to a reenlistment rate increase of 3.1 percentage points (compared to FY96-FY00). Thus, the impact of the SRB increased by 2.7 percentage points between fiscal years 1996-2000 and 2001.
- Most MOSs have higher reenlistment probabilities relative to the Infantry MOS. Specifically, when the model controls for relative pay, Marines in non-infantry occupations (with the exception of Marines in food service

and logistical specialties) are 7.1 to 33.9 percentage points more likely to reenlist. That is, while Marines in aviation-related specialties have the highest probabilities of reenlistment, Marines in clerical and military police/explosives specialties have the lowest reenlistment rates relative to the Skill Family Combat. Further, Marines in logistical and food service occupations are 2.3 and 28.9 percentage points less likely to reenlist than Marines in infantry-related occupations, respectively.

- Higher military-to-civilian pay ratios are associated with higher reenlistment rates. A 1-percentage point increase in relative pay results in a 2.8 percent increase in the reenlistment rate.
- State-level unemployment rates had a negative effect on first-term reenlistment rates. Specifically, a 1-percentage point increase in the unemployment rate results in a negligible decrease in the reenlistment rate.
- Women are 2 percentage points less likely to reenlist than are men.
- Non-whites are 6.9 to 7.3 percentage points more likely to reenlist than leave active service, but non-white ‘stayers’ are 2.6 to 3.2 percentage points more likely to reenlist than extend.
- While Marines who are married and/or have dependents are 10.2 percentage points more likely to reenlist than leave active service, ‘stayers’ with dependents are 13.4 to 13.6 percentage points more likely to reenlist than extend.
- Marines who score above the 50<sup>th</sup> percentile on the Armed Forces Qualification Test are approximately 1.0 to 1.7 percentage points less likely to reenlist than Marines who score below the 50<sup>th</sup> percentile on the AFQT.

## **B. CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH**

The primary research question of this thesis was to better understand the effect of the SRB lump sum payment method as an incentive to reenlist. This research suggests that the relationship between the lump sum payment method and reenlistment rates is positive and significant. This thesis supports Dave Ross' prediction, “that the effects of a SRB payment method change to lump sum will increase retention levels compared to the current SRB payment method.” [Ref 1:p 70]

The basic models found that a Marine offered a lump sum SRB is 5.8 percentage points more likely to reenlist than a Marine offered an installment bonus during FY99-00. Thus, the impact of the SRB increased by 2.6 percentage points between fiscal year 1999-2000 and fiscal year 2001. This finding validates Ross’ estimate that the personal

discount rate (PDR) for first-term enlisted Marines is approximately .41. The practical impact of this finding is noteworthy. If a Marine's personal discount rate is .41, he is indifferent between receiving a SRB of \$20,000 paid over time in partial installments versus a lump sum payment of \$15,230, a difference of \$4,770 or 24 percent. Thus, the estimate of a personal discount rate of .41 has the potential to increase reenlistment rates using the same amount of budgetary dollars, or to achieve the same reenlistment rate for a lower budgetary expenditure. [Ref 1: p. 6] Future studies should note that there are differences in individual PDRs across various demographic groups. Thus, it is difficult to pick a "single" PDR to analyze the behavior of Marines eligible for a Zone A reenlistment bonus. [Ref 1:pp. 26-27] However, the author believes that the PDR of .41 offers the Marine Corps the opportunity to carefully consider reevaluating the dollar amount of SRB it pays to Zone A enlisted Marines.

The lump sum bonus increased a Marine's relative probability of reenlisting versus extending by 1.5 to 3.0 percentage points between fiscal years 1999 and 2001. A Marine offered a lump sum SRB is 5.5 percentage points more likely to reenlist than extend (compared to a Marine offered an installment bonus during FY99-00). This finding is consistent with Hosek and Peterson's research that found the added advantage of the lump sum bonus comes primarily from channeling stayers into long-term reenlistments. Note that Table 10 pointed out a 5.3 percentage point increase in the reenlist to stayer rate between FY99 and FY01.

As previously noted, the present study evaluated first-term reenlistment data captured during the first year of the lump sum payment method. A one-level increase in the SRB multiple during FY01 is related to a reenlistment rate increase of 2.6 percentage points (compared to FY99-00). This finding is consistent with the prior research on the impact of the lump sum bonus on reenlistment decisions completed by Warner and Goldberg (1982). However, the significance of the lump sum SRB appears to vary as controls for pay, unemployment, and fiscal years are added to the models. Perhaps the mixing of pay and bonus variables in the specification may bias the effect of the bonus. Future studies could use a single relative pay measure to proxy compensation. Future regression studies should include more years of data that could provide greater variability in the effect of the lump sum bonus on reenlistment decisions. Further, future studies

could use the other branches of the armed forces that are not offering the lump sum bonus as part of the control group. Additionally, proxy variables for quality-of-life, and deployment time could be included.

<b>Model</b>	<b>FY</b>	<b>SRB Multiple</b>					
		<u><b>0</b></u>	<u><b>1</b></u>	<u><b>2</b></u>	<u><b>3</b></u>	<u><b>4</b></u>	<u><b>5</b></u>
<b>2A</b>	<b>99-00</b>	<b>.223</b>	<b>.241</b>	<b>.260</b>	<b>.280</b>	<b>.301</b>	<b>.322</b>
	<b>01</b>	<b>.249</b>	<b>.267</b>	<b>.286</b>	<b>.306</b>	<b>.327</b>	<b>.348</b>

Table 34. Predicted Reenlistment Rates by Multiple (Based on Logit Model 2A).

Table 34 shows the predicted reenlistment rates by SRB multiple based on logit model 2A. The results displayed in Table 34 suggest that higher SRB multiples are associated to higher reenlistment rates. Further, the results displayed in Table 34 suggest that the lump sum payment method is associated with a marked increase in long-term reenlistment commitments by Marines not offered a bonus (compared to FY99-00), and an overall increase in the predicted reenlistment rates of Marines at all multiple levels (compared to FY99-00).

Marines in the Skill Families LOG and FOOD were 2.0 percentage points and 29.3 percentage points less likely to reenlist than Marines in the Skill Family CO, respectively. Perhaps this is due to the food service occupational specialty being downsized during fiscal year 1999, or to the fact that Marines in the Skill Family Food were not offered a SRB multiple during FY99-FY01. Earning opportunities in comparable civilian occupations for Marines in logistics and food-related specialties are the lowest of the Skill Families. Therefore, it is counterintuitive to suggest that employment opportunities and pay for logistics and food-service Marines facing the first-term reenlistment decision were competitive in the private sector during fiscal years 1999-2001. Perhaps the relatively low reenlistment rate for Marines in food and logistics-related specialties is related to their operational tempo. Furthermore, as previously noted in Chapter IV, some Marines have suggested that the offer of a lump sum bonus to certain Marines may have a negative impact upon reenlistment. Future

studies could explore this speculation and the relationship between operational tempo, quality-of-life, and retention by individual occupational specialties.

Previous studies have found significant, positive effects of relative pay on reenlistment rates. [Quester and Adedeji, 1991; Hosek and Peterson, 1985; and North, 1994] The calculated elasticity from the logit model is similar to that of Quester and Adedeji. Mehay points out “if SRB managers identify shortages in specific (occupations), they need (occupation)-specific pay effects to determine the bonus increase that will eliminate the shortage in each specific (occupation).” [Ref 27:p. 15] Future studies should calculate occupation-specific pay elasticities and consider how Department of Defense analysts could use the various pay elasticities to: 1) optimally target specific occupations with retention bonuses, and/or 2) create occupation-specific pay tables. Perhaps future studies could explore replacing retention bonuses with occupation-specific pay tables. Analysts argue that until the Department of Defense creates occupation-specific pay tables, the SRB program will be a necessary tool to maintain an adequate level of experienced and qualified enlisted personnel in the peacetime forces of the uniformed services. [Ref 39]

Two of the results in the present study differ from that of previous research. First, previous studies have found significant, positive effects of unemployment on retention. Secondly, women Marines are less likely to reenlist than are men. Most researchers would agree that unemployment rates at the time of reenlistment are a likely influence on decisions to reenlist. [Warner and Goldberg, 1982; Quester and Adedeji, 1991] The present study used home-of-record (state-specific) unemployment data that are tied to the year of a Marine’s reenlistment decision. A more accurate determinant of retention may be unemployment rates at a Marine’s current duty station. Since Marines socialize with civilian peers in the community surrounding their duty station, perhaps the unemployment rate in the region their duty station is located may be a more accurate determinant of retention. Home-of-record or national level unemployment rates may be accurate determinants for Marines stationed overseas.

One explanation for the unexpected result regarding women Marines may be the small number of women in the sample. Additionally, Chapter V pointed out that the



significant increase in reenlistment rates for Marines not offered a bonus (in the all-male Skill Families of Combat and Field Artillery) might have caused problems for the estimate of female reenlistment rates. A more anecdotal explanation may be related to pre-enlistment attitudes. According to the Youth Attitude Tracking Study in 1992, women have a much lower propensity to enlist than do men. [Ref 40:p. 69] Perhaps, women who enter the Marine Corps are less confident of their decision to join the Marine Corps, and therefore less likely to remain at the end of their current contract. A preliminary analysis of the 1999 Marine Corps Web-Based Exit Survey revealed two unique factors that impacted women Marines' decisions to leave the Marine Corps--"unit morale" and the "impact of career on my kids." [Ref 41:p. 17] Future longitudinal research could confirm the current relationship between women Marines and the propensity to reenlist.

As previously noted, the present study discovered significant, positive effects of race and marital status on the propensity to reenlist. These results are consistent with previous research. It is clear that the results do not suggest a reason for the significant, positive effects of these factors. Why, precisely, do these Marines have a greater propensity to reenlist than leave active service? Furthermore, why, are non-white Marines relatively less prone to reenlist when faced with the choice to reenlist or extend (compared to when they are faced with the choice to reenlist or leave)? According to a preliminary analysis of the 1999 Marine Corps Retention Survey, Marines with family obligations place great importance on current pay, medical and retirement benefits, and advancement opportunities. [Ref 42:p. 21] Similarly, the 1999 USMC Exit Survey suggests that non-white Marines' retention behavior is sensitive to changes in "incentive pay," "career advancement and development," "immediate seniors' leadership characteristics," and "current duty location." Further, approximately half of the respondents who left the Marine Corps rated racial discrimination as "not important" to their decision to leave. [Ref 41:p. 17] Perhaps, while the opportunity offered by the Marine Corps for an individual to be evaluated as a Marine and not as a "racial minority" motivates non-white Marines to reenlist (when offered the choice of reenlist or leave), there is an intangible measure of uncertainty with their place in the Marine Corps combined with greater opportunities in the private sector that offer the luxury of

indecision when faced with making a long-term reenlistment commitment. Future studies could augment the results of this thesis by discovering the reasons contributing to a non-white Marine's decision to enlist, reenlist, and extend. Similarly, the true reasons why a Marine with marital and/or parenting obligations reenlisted should be captured. One way to capture the true reason why an individual reenlists (and/or extends) is to conduct a personal interview immediately prior to their reenlistment date.

As noted in Chapter I, the Marine Corps initiated the Subsequent Term Alignment Plan (STAP) in October 2001. According to this new policy, career force Marines are offered the lump sum SRB. At the time of this writing (November 2001) the Marine Corps had reenlisted approximately 10 percent of the STAP reenlistment target. At the same time, 59 percent of the First Term Alignment Plan (FTAP) reenlistment target had been attained. In order to support STAP with SRB dollars, the dollar amount of bonuses offered to Zone A eligible Marines was decreased from fiscal year 2001 levels. Future studies should answer the following questions for Marines facing reenlistment decisions in Zone A, B, and C:

- What was the change in career force retention levels as a result of implementing STAP?
- What is the impact of personal characteristics on reenlistment decisions?
- What is the impact of civilian pay and unemployment on reenlistment decisions?
- What is the impact of the SRB multiple being offered under the installment and lump sum payment methods?
- What are the optimal funding requirements for FTAP and STAP?
- What is the impact of STAP on FTAP reenlistment targets?
- What are the occupation-specific pay effects for Zone A, B and C Marines?

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**APPENDIX A. STATE-SPECIFIC UNEMPLOYMENT RATES:  
FISCAL YEARS 1999 THROUGH 2001**

<b>STATE</b>	<b>FY 99</b>	<b>FY 00</b>	<b>FY 01</b>
Alabama	4.6	4.7	4.7
Alaska	6.1	6.8	6.6
Arizona	4.4	4.0	3.7
Arkansas	4.7	4.5	4.3
California	5.4	5	4.8
Colorado	3.1	2.8	2.6
Connecticut	3.2	2.6	2.0
Delaware	3.5	4.0	3.7
Wash DC	6.9	5.7	5.7
Florida	4.0	3.6	3.6
Georgia	4.0	3.9	3.4
Hawaii	5.9	4.6	4.2
Idaho	5.2	4.9	5.1
Illinois	4.3	4.3	4.9
Indiana	3.0	3.4	3.0
Iowa	2.6	2.6	2.8
Kansas	3.1	3.6	3.7
Kentucky	4.5	4.2	4.2
Louisiana	5.2	5.3	5.6
Maine	4.1	3.8	3.2
Maryland	3.7	3.8	3.7
Massachusetts	3.2	2.8	2.7
Michigan	3.9	3.5	4.3
Minnesota	2.7	3.2	3.4
Mississippi	5.0	5.7	4.9
Missouri	3.5	3.4	3.7
Montana	5.1	5.0	5.0
Nebraska	2.8	2.9	2.9
Nevada	4.4	4.1	4.4
New Hampshire	2.7	2.9	2.5
New Jersey	4.7	3.9	3.8
New Mexico	5.9	4.8	5.2
New York	5.3	4.7	4.4
North Carolina	3.1	3.5	4.2
North Dakota	3.5	3.1	2.6
Ohio	4.3	4.2	2.3
Oklahoma	3.8	3.1	2.9
Oregon	5.8	5.1	4.9
Pennsylvania	4.5	4.2	4.4
Rhode Island	4.2	4.2	3.9
South Carolina	4.4	4.2	3.6
South Dakota	3.0	2.4	2.4
Tennessee	4.1	3.9	4.2
Texas	4.7	4.4	3.8
Utah	3.9	3.3	3.3
Vermont	3.1	3.0	3.0
Virginia	2.8	2.3	2.2
Washington	4.8	5.1	5.5
West Virginia	6.7	5.7	5.6
Wisconsin	3.1	3.5	3.9
Wyoming	5.0	4.0	3.9

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## APPENDIX B. MILITARY BASE PAY: 1995 THROUGH 2001

<u>Rank</u>	<u>Years of Service</u>	<u>Military Base Pay Effective 1 October of each Year **</u>						
		<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>
PVT (E1)	1	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PVT (E1)	2	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PVT (E1)	3	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PVT (E1)	4	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PVT (E1)	5	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PVT (E1)	6	\$ 10,253	\$ 9,709	\$ 10,812	\$ 11,112	\$ 11,513	\$ 12,067	\$ 12,514
PFC (E2)	1	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
PFC (E2)	2	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
PFC (E2)	3	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
PFC (E2)	4	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
PFC (E2)	5	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
PFC (E2)	6	\$ 11,491	\$ 11,768	\$ 12,120	\$ 12,456	\$ 12,910	\$ 13,529	\$ 14,029
LCPL (E3)	1	\$ 11,941	\$ 12,229	\$ 12,600	\$ 12,498	\$ 13,414	\$ 14,058	\$ 14,576
LCPL (E3)	2	\$ 12,596	\$ 12,899	\$ 13,284	\$ 13,656	\$ 14,148	\$ 14,828	\$ 15,685
LCPL (E3)	3	\$ 13,097	\$ 13,410	\$ 13,812	\$ 14,196	\$ 14,710	\$ 15,415	\$ 16,603
LCPL (E3)	4	\$ 13,615	\$ 13,943	\$ 14,364	\$ 14,760	\$ 15,296	\$ 16,031	\$ 16,625
LCPL (E3)	5	\$ 13,615	\$ 13,943	\$ 14,364	\$ 14,760	\$ 15,296	\$ 16,031	\$ 16,625
LCPL (E3)	6	\$ 13,615	\$ 13,943	\$ 14,364	\$ 14,760	\$ 15,296	\$ 16,031	\$ 16,625
CPL (E4)	1	\$ 12,672	\$ 12,974	\$ 13,368	\$ 13,740	\$ 14,231	\$ 14,915	\$ 15,466
CPL (E4)	2	\$ 13,385	\$ 13,705	\$ 14,112	\$ 14,508	\$ 15,034	\$ 15,754	\$ 17,086
CPL (E4)	3	\$ 14,173	\$ 14,512	\$ 14,952	\$ 15,360	\$ 15,919	\$ 16,682	\$ 18,007
CPL (E4)	4	\$ 15,264	\$ 15,631	\$ 16,104	\$ 16,548	\$ 17,143	\$ 17,968	\$ 18,914
CPL (E4)	5	\$ 15,264	\$ 15,631	\$ 16,104	\$ 16,548	\$ 17,143	\$ 17,968	\$ 18,914
CPL (E4)	6	\$ 15,869	\$ 16,250	\$ 16,740	\$ 17,208	\$ 17,824	\$ 18,680	\$ 19,836
SGT (E5)	1	\$ 13,586	\$ 13,914	\$ 14,328	\$ 14,736	\$ 15,260	\$ 15,991	\$ 16,582
SGT (E5)	2	\$ 14,789	\$ 15,145	\$ 15,600	\$ 16,032	\$ 16,610	\$ 17,406	\$ 18,590
SGT (E5)	3	\$ 15,509	\$ 15,880	\$ 16,356	\$ 16,812	\$ 17,417	\$ 18,252	\$ 19,487
SGT (E5)	4	\$ 16,182	\$ 16,571	\$ 17,064	\$ 17,544	\$ 18,176	\$ 19,044	\$ 20,412
SGT (E5)	5	\$ 16,182	\$ 16,571	\$ 17,064	\$ 17,544	\$ 18,176	\$ 19,044	\$ 20,412
SGT (E5)	6	\$ 17,248	\$ 17,662	\$ 18,192	\$ 18,696	\$ 19,372	\$ 20,300	\$ 21,334

\*\*Military base pay effective 1 October for each year was used as the numerator in the Military-to-Civilian Pay Ratio for the fiscal year that the Marine reached his first reenlistment decision point. For example, a 3-year CPL with an ECC of 1 December 1995 would reach his first reenlistment decision point during FY 1996. In this case 1995 military pay data would be used as the numerator (\$14,173.20).

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**APPENDIX C. SELECTIVE REENLISTMENT BONUS MULTIPLES  
AND PRIMARY MILITARY OCCUPATIONAL SPECIALTIES BY  
SKILL FAMILY**

<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
Aircraft Maintenance (ACM)	6000	0	0	0
	6011	0	0	0
	6012	0	0	0
	6013	4	5	0
	6014	4	4	0
	6015	1	3	0
	6016	2	4	0
	6017	1	3	0
	6018	0	0	0
	6019	0	0	0
	6022	4	5	0
	6023	0	0	0
	6025	3	5	0
	6026	4	4	0
	6027	3	5	0
	6030	5	5	0
	6031	5	5	0
	6032	5	5	0
	6033	0	0	0
	6035	2	5	0
	6042	1	2	2
	6051	0	0	0
	6052	0	0	0
	6053	4	3	0
	6054	0	0	0
	6055	2	5	0
	6056	3	4	0
	6057	3	5	0
	6058	0	0	0
	6060	2	5	0
	6062	0	0	4
	6071	0	0	0
	6072	1	2	3
	6073	1	2	2
	6074	0	0	3
	6075	4	2	0
	6081	0	0	0
<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
Aircraft Maintenance (ACM)	6082	0	0	0
	6083	3	5	0
	6084	0	0	0
	6085	3	5	0
	6086	3	5	0
	6087	2	4	0
	6088	0	0	0
	6091	0	0	0
	6092	3	4	3
	6093	0	0	0
	6094	3	4	0
	6098	0	0	0
	6111	0	0	0
	6112	1	3	4
	6113	1	2	3
	6114	3	3	2
	6115	0	0	0
	6116	0	0	0
	6119	0	0	0
	6122	2	5	2
	6123	3	1	1
	6124	4	4	3
	6132	3	4	3
	6135	0	5	0
	6143	0	0	0
	6151	0	0	0
	6152	5	5	4
	6153	2	4	3
	6154	2	3	3
	6155	0	0	0
	6156	0	0	4
	6172	4	5	4
	6173	3	4	5
	6174	4	5	4
	6175	0	0	0
	6176	0	0	4



<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
<b>Band (BA)</b>				
	5500	0	0	0
	5519	0	0	0
	5521	0	0	0
	5523	0	0	0
	5526	0	0	0
	5528	0	0	0
	5534	0	0	0
	5536	0	0	0
	5537	0	0	0
	5541	0	0	0
	5543	0	0	0
	5544	0	0	0
	5546	0	0	0
	5547	0	0	0
	5548	0	0	0
	5563	0	0	0
	5565	0	0	0
	5566	0	0	0
	9811	0	0	0
	9812	0	0	0
<b>Combat (CO)</b>				
	0300	0	0	0
	0311	1	1	1
	0321	3	0	3
	0331	0	0	1
	0341	0	0	1
	0351	0	0	1
	0369	0	0	0

<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
<b>Clerical (CL)</b>				
	0000	0	0	0
	0100	0	0	0
	0121	0	0	0
	0131	0	0	0
	0151	0	0	0
	0193	0	0	0
	0500	0	0	0
	0511	0	5	4
	2542	0	0	0
	2549	0	0	0
	3000	0	0	0
	3043	0	0	0
	3044	0	0	0
	3051	0	0	0
	3052	0	1	0
	3100	0	0	0
	3112	0	0	0
	3400	0	0	0
	3421	0	0	0
	3431	0	0	0
	3432	1	0	1
	4400	0	0	0
	4100	0	0	0
	4133	0	0	0
	4421	0	0	0
	4429	0	0	0
	4600	0	0	0
	4611	0	0	1
	4612	0	0	0
	4615	0	0	0
	4621	0	0	0
	4641	0	0	0
	4653	0	0	0
	4671	0	0	0
	4691	0	0	0
	6046	2	2	3
	6047	2	2	0
	6048	0	0	3
	7041	1	1	2

<b>SKILL FAMILY</b>	<b>PMOS</b>	<b>FY99</b>	<b>FY00</b>	<b>FY01</b>
<b>Electronics</b>				
<b>Repair (EL)</b>	<b>1100</b>	<b>0</b>	<b>0</b>	<b>0</b>
	1141	1	1	0
	1142	1	1	0
	1143	0	0	0
	2500	0	0	0
	2512	1	1	0
	2513	0	0	0
	2514	0	2	0
	2515	0	0	0
	2519	0	0	0
	2531	0	1	0
	2532	0	0	0
	2534	0	0	0
	2535	5	0	0
	2536	0	0	0
	2537	0	0	0
	2538	0	5	0
	2591	0	0	0
	2800	0	0	0
	2811	5	5	4
	2813	5	0	0
	2818	4	5	5
	2821	0	5	5
	2822	5	5	5
	2823	0	5	5
	2826	0	0	0
	2831	5	5	5
	2832	0	5	5
	2834	0	0	0
	2841	4	5	5
	2861	0	5	5
	2871	5	5	5
	2874	0	0	5
	2881	2	2	4
	2884	0	0	0
	2885	3	0	0
	2886	0	2	4

<b>SKILL FAMILY</b>	<b>PMOS</b>	<b>FY99</b>	<b>FY00</b>	<b>FY01</b>
<b>Electronics</b>				
<b>Repair (EL)</b>	<b>2887</b>	<b>4</b>	<b>5</b>	<b>5</b>
	2889	0	0	0
	2891	0	0	0
	5900	0	0	0
	5914	0	0	0
	5915	0	0	0
	5918	0	0	0
	5924	0	0	0
	5925	0	0	0
	5928	0	0	0
	5937	3	5	4
	5939	3	0	4
	5942	1	3	2
	5944	0	0	0
	5947	0	0	0
	5948	1	0	2
	5952	3	5	4
	5953	3	5	4
	5954	2	3	4
	5959	0	0	0
	5962	5	5	4
	5963	2	3	3
	5964	0	0	0
	5974	5	5	4
	5978	0	0	0
	5979	2	3	3
	5993	0	0	0
	5994	0	0	0
	6211	0	0	0
	6212	0	0	2
	6213	0	0	4
	6214	0	0	4
	6216	0	0	3
	6217	0	0	3
	6222	0	0	4
	6223	0	0	4

<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
Electronics				
Repair (EL)	6226	0	0	3
	6227	0	0	5
	6232	0	0	5
	6241	0	0	0
	6242	0	0	0
	6251	0	0	0
	6252	0	0	3
	6253	0	0	3
	6256	0	0	3
	6257	0	0	4
	6282	0	0	2
	6283	0	0	5
	6286	0	0	2
	6287	0	0	3
	6300	0	0	0
	6311	0	0	0
	6312	0	0	4
	6313	3	3	3
	6314	3	2	3
	6315	3	3	0
	6316	4	2	4
	6317	4	5	4
	6318	0	0	0
	6322	3	4	4
	6323	2	4	4
	6324	3	4	4
	6325	0	0	0
	6326	0	0	0
	6331	0	0	0
	6332	0	0	3
	6333	2	3	4
	6335	1	1	0
	6336	1	1	2
	6337	2	3	4
	6353	0	0	0
	6354	0	0	0

<u>SKILL FAMILY</u>	<u>PMOS</u>	<u>FY99</u>	<u>FY00</u>	<u>FY01</u>
Electronics				
Repair (EL)	6355	0	0	0
	6386	4	5	4
	6391	0	0	0
	6411	0	0	0
	6412	2	4	4
	6413	2	4	4
	6414	0	0	0
	6423	1	2	2
	6431	0	0	0
	6432	1	2	2
	6433	1	1	2
	6434	0	0	0
	6461	0	0	0
	6462	2	2	2
	6463	1	4	5
	6464	0	3	3
	6465	0	1	1
	6466	3	5	5
	6467	4	0	1
	6468	1	1	2
	6469	0	0	0
	6482	4	3	2
	6483	1	1	2
	6484	2	1	2
	6485	0	0	0
	6486	0	0	0
	6491	0	0	0
	6492	1	4	3
	6493	1	2	3
	6494	3	4	2

SKILL FAMILY	PMOS	FY99	FY00	FY01
<b>Field Artillery (FA)</b>	0800	0	0	0
	0811	0	0	1
	0842	1	4	3
	0844	1	4	4
	0847	2	1	1
	0848	0	0	0
	0861	1	1	1
	1800	0	0	0
	1811	0	0	0
	1812	0	1	1
	1833	0	1	1
	7200	0	0	0
	7212	3	3	3
<b>Food Service (FOOD)</b>	3300	0	0	0
	3361	0	0	0
	3381	0	0	0
<b>Mechanical Maintenance (MM)</b>	0161	0	0	0
	1161	0	1	1
	1169	0	0	0
	1171	0	1	0
	1181	0	1	0
	1300	0	0	0
	1316	0	0	0
	1341	0	0	0
	1345	0	0	0
	1349	0	0	0
	1361	0	0	0
	1371	0	0	0
	1391	0	0	0
	2100	0	0	0
	2111	0	0	1
	2131	1	0	2
	2141	1	1	1
	2145	0	0	0
	2146	1	1	1
	2147	1	0	1
	2149	0	0	0
	2161	0	2	1
	2171	2	2	2
	2181	0	0	0
	6500	0	0	0
	6511	0	0	0
	6521	0	0	0
	6531	1	2	2
	6541	1	1	3
	6591	0	0	0
	7000	0	0	0
	7011	0	0	2
	7051	1	1	2

SKILL FAMILY	PMOS	FY99	FY00	FY01
<b>General Technical (GT)</b>	0200	0	0	0
	0211	0	4	5
	0231	5	5	4
	0241	0	4	5
	0251	5	4	5
	0261	5	2	2
	0291	0	0	0
	0600	0	0	0
	0612	0	0	1
	0613	0	0	0
	0614	0	0	2
	0619	0	0	0
	0621	0	0	1
	0622	0	0	1
	0624	0	0	1
	0626	0	0	5
	0627	0	0	3
	0629	0	0	0
	0691	0	0	0
	1521	0	0	0
	1541	0	0	0
	2600	0	0	0
	2621	2	4	3
	2629	0	0	0
	2631	2	2	3
	2651	1	3	3
	2671	4	5	4
	2673	4	5	4
	2674	3	4	4
	2675	5	0	0
	2676	0	5	4
	2691	0	0	0
	3441	0	0	0
	3451	0	3	1
	4000	0	0	0
	4034	0	0	0
	4066	4	5	5
	4067	4	5	5
	4069	0	0	0
	4099	0	0	0
	4300	0	0	0
	4341	5	5	4
	6800	0	0	0
	6821	2	4	5
	6822	0	0	0
	6842	2	4	5
	7381	0	0	0
	7382	5	5	4
	8412	0	0	0
	9917	0	0	0
	9919	5	0	0
	9956	0	0	0

<b>SKILL FAMILY</b>	<b>PMOS</b>	<b>FY99</b>	<b>FY00</b>	<b>FY01</b>
<b>Logistics (LOG)</b>	<b>0400</b>	0	0	0
	<b>0411</b>	1	2	1
	<b>0431</b>	1	2	1
	<b>0451</b>	0	2	2
	<b>0481</b>	0	1	2
	<b>0491</b>	0	0	0
	<b>6600</b>	0	0	0
	<b>6672</b>	0	0	0
	<b>6673</b>	0	4	2
<b>MP/NBC/ EOD/Ammo (MP)</b>	<b>0313</b>	1	0	1
	<b>0352</b>	0	0	1
	<b>2300</b>	0	0	0
	<b>2311</b>	1	1	1
	<b>2336</b>	0	0	1
	<b>2351</b>	1	0	0
	<b>5700</b>	0	0	0
	<b>5711</b>	2	2	2
	<b>5800</b>	0	0	0
	<b>5811</b>	0	0	0
	<b>5815</b>	0	0	0
	<b>5821</b>	0	0	1
	<b>5831</b>	1	1	2
	<b>8111</b>	0	0	0
	<b>8531</b>	0	0	0
	<b>8532</b>	0	0	0
	<b>8551</b>	0	0	0
	<b>8641</b>	0	0	0
	<b>9900</b>	0	0	0
	<b>9971</b>	0	0	0
	<b>9972</b>	0	0	0

<b>SKILL FAMILY</b>	<b>PMOS</b>	<b>FY99</b>	<b>FY00</b>	<b>FY01</b>
<b>Motor Transport (MT)</b>	<b>3500</b>	0	0	0
	<b>3513</b>	0	0	0
	<b>3521</b>	0	0	0
	<b>3522</b>	0	0	0
	<b>3523</b>	0	0	0
	<b>3524</b>	0	0	0
	<b>3529</b>	0	0	0
	<b>3531</b>	0	0	0
	<b>3533</b>	0	0	0
	<b>3535</b>	0	0	0
	<b>3537</b>	0	0	0
<b>Navigator/ ATC (NAV)</b>	<b>7222</b>	0	0	0
	<b>7234</b>	2	5	4
	<b>7236</b>	2	5	4
	<b>7242</b>	2	2	3
	<b>7251</b>	0	0	0
	<b>7252</b>	4	0	0
	<b>7253</b>	4	0	0
	<b>7254</b>	0	0	0
	<b>7257</b>	0	5	4
	<b>7291</b>	0	0	4
	<b>7300</b>	0	0	0
	<b>7311</b>	0	0	0
	<b>7312</b>	0	0	0
	<b>7314</b>	5	5	4
	<b>7371</b>	0	0	0
	<b>7372</b>	5	5	4

## APPENDIX D. CURRENT POPULATION SURVEY CODES

1990 Census of Population - Occupation Classification  
(Numbers in parentheses are the 1990 SOC code equivalent; "Pt" means part;  
"n.e.c." means not elsewhere classified.)

Code	Census
not used	0-2
MANAGERIAL AND PROFESSIONAL SPECIALTY OCCUPATIONS	3-199
Executive, administrative, and managerial occupations	3-37
Legislators (111)	3
Chief executives & general administrators, public administration (112)	4
Administrators and officials, public administration (1132-1139)	5
Administrators, protective services (1131)	6
Financial managers (122)	7
Personnel and labor relations managers (123)	8
Purchasing managers (124)	9
not used	10-12
Managers, marketing, advertising, and public relations (125)	13
Administrators, education and related fields (128)	14
Managers, medicine and health (131)	15
Postmasters and mail superintendents (1344)	16
Managers, food serving and lodging establishments (1351)	17
Managers, properties and real estate (1353)	18
Funeral directors (pt 1359)	19
not used	20
Managers, service organizations, n.e.c. (127, 1352, 1354, pt 1359)	21
Managers and administrators, n.e.c. (121, 126, 132-1343, 136-139)	22
Management related occupations	23-37
Accountants and auditors (1412)	23
Underwriters (1414)	24
Other financial officers (1415, 1419)	25
Management analysts (142)	26
Personnel, training, and labor relations specialists (143)	27
Purchasing agents and buyers, farm products (1443)	28
Buyers, wholesale and retail trade except farm products (1442)	29
not used	30-32
Purchasing agents and buyers, n.e.c. (1449)	33
Business and promotion agents (145)	34
Construction inspectors (1472)	35
Inspectors and compliance officers, exc. construction (1473)	36

Management related occupations, n.e.c. (149)	37
not used	38-42
Professional specialty occupations	43-199
Engineers, architects, and surveyors	43-63
Architects (161)	43
Engineers	44-59
Aerospace (1622)	44
Metallurgical and materials (1623)	45
Mining (1624)	46
Petroleum (1625)	47
Chemical (1626)	48
Nuclear (1627)	49
not used	50-52
Civil (1628)	53
Agricultural (1632)	54
Electrical and electronic (1633, 1636)	55
Industrial (1634)	56
Mechanical (1635)	57
Marine and naval architects (1637)	58
Engineers, n.e.c. (1639)	59
not used	60-62
Surveyors and mapping scientists (164)	63
Mathematical and computer scientists	64-68
Computer systems analysts and scientists (171)	64
Operations and systems researchers and analysts (172)	65
Actuaries (1732)	66
Statisticians (1733)	67
Mathematical scientists, n.e.c. (1739)	68
Natural scientists	69-83
Physicists and astronomers (1842, 1843)	69
not used	70-72
Chemists, except biochemists (1845)	73
Atmospheric and space scientists (1846)	74
Geologists and geodesists (1847)	75
Physical scientists, n.e.c. (1849)	76
Agricultural and food scientists (1853)	77
Biological and life scientists (1854)	78
Forestry and conservation scientists (1852)	79
not used	80-82
Medical scientists (1855)	83
Health diagnosing occupations	84-89
Physicians (261)	84
Dentists (262)	85
Veterinarians (27)	86
Optometrists (281)	87
Podiatrists (283)	88
Health diagnosing practitioners, n.e.c. (289)	89
not used	90-94
Health assessment and treating occupations	95-106
Registered nurses (29)	95
Pharmacists (301)	96
Dietitians (302)	97
Therapists	98-105
Respiratory therapists (3031)	98
Occupational therapists (3032)	99
not used	100-102
Physical therapists (3033)	103
Speech therapists (3034)	104

Therapists, n.e.c. (3039)	105
Physicians' assistants (304)	106
not used	107-112
Teachers, postsecondary	113-154
Earth, environmental, and marine science teachers (2212)	113
Biological science teachers (2213)	114
Chemistry teachers (2214)	115
Physics teachers (2215)	116
Natural science teachers, n.e.c. (2216)	117
Psychology teachers (2217)	118
Economics teachers (2218)	119
not used	120-122
History teachers (2222)	123
Political science teachers (2223)	124
Sociology teachers (2224)	125
Social science teachers, n.e.c. (2225)	126
Engineering teachers (2226)	127
Mathematical science teachers (2227)	128
Computer science teachers (2228)	129
not used	130-132
Medical science teachers (2231)	133
Health specialties teachers (2232)	134
Business, commerce, and marketing teachers (2233)	135
Agriculture and forestry teachers (2234)	136
Art, drama, and music teachers (2235)	137
Physical education teachers (2236)	138
Education teachers (2237)	139
not used	140-142
English teachers (2238)	143
Foreign language teachers (2242)	144
Law teachers (2243)	145
Social work teachers (2244)	146
Theology teachers (2245)	147
Trade and industrial teachers (2246)	148
Home economics teachers (2247)	149
not used	150-152
Teachers, postsecondary, n.e.c. (2249)	153
Postsecondary teachers, subject not specified	154
Teachers, Except postsecondary	155-159
Teachers, prekindergarten and kindergarten (231)	155
Teachers, elementary school (232)	156
Teachers, secondary school (233)	157
Teachers, special education (235)	158
Teachers, n.e.c. (236, 239)	159
not used	160-162
Counselors, educational and vocational (24)	163
Librarians, archivists, and curators	164-165
Librarians (251)	164
Archivists and curators (252)	165
Social scientists and urban planners	166-173
Economists (1912)	166
Psychologists (1915)	167
Sociologists (1916)	168
Social scientists, n.e.c. (1913, 1914, 1919)	169
not used	170-172
Urban planners (192)	173
Social, recreation, and religious workers	174-177
Social workers (2032)	174



Recreation workers (2033)	175
Clergy (2042)	176
Religious workers, n.e.c. (2049)	177
Lawyers and judges	178-179
Lawyers (211)	178
Judges (212)	179
not used	180-182
Writers, artists, entertainers, and athletes	183-199
Authors (321)	183
Technical writers (398)	184
Designers (322)	185
Musicians and composers (323)	186
Actors and directors (324)	187
Painters, sculptors, craft-artists, & artist print-makers (325)	188
Photographers (326)	189
not used	190-192
Dancers (327)	193
Artists, performers, and related workers, n.e.c. (328, 329)	194
Editors and reporters (331)	195
not used	196
Public relations specialists (332)	197
Announcers (333)	198
Athletes (34)	199
not used	200-202
TECHNICAL, SALES, AND ADMINISTRATIVE SUPPORT OCCUPATIONS	203-389
Technicians and related support occupations	203-235
Health technologists and technicians	203-208
Clinical laboratory technologists and technicians (362)	203
Dental hygienists (363)	204
Health record technologists and technicians (364)	205
Radiology technicians (365)	206
Licensed practical nurses (366)	207
Health Technologists and technicians, n.e.c. (369)	208
not used	209-212
Technologists and technicians, except health	213-235
Engineering and related technologists and technicians	213-218
Electrical and electronic technicians (3711)	213
Industrial engineering technicians (3712)	214
Mechanical engineering technicians (3713)	215
Engineering technicians, n.e.c. (3719)	216
Drafting occupations (372)	217
Surveying and mapping technicians (373)	218
not used	219-222
Science technicians	223-225
Biological technicians (382)	223
Chemical technicians (3831)	224
Science technicians, n.e.c. (3832, 3833, 384, 389)	225
Technicians; except health, engineering, and science	226-235
Airplane pilots and navigators (825)	226
Air traffic controllers (392)	227
Broadcast equipment operators (393)	228
Computer programmers (3971, 3972)	229
not used	230-232
Tool programmers, numerical control (3974)	233
Legal assistants (396)	234
Technicians, n.e.c. (399)	235

not used	236-242
Sales occupations	243-285
Supervisors and proprietors, sales occupations (40)	243
not used	244-252
Sales representatives, finance and business services	253-257
Insurance sales occupations (4122)	253
Real estate sales occupations (4123)	254
Securities & financial services sales occupations (4124)	255
Advertising and related sales occupations (4153)	256
Sales occupations, other business services (4152)	257
Sales representatives, commodities except retail	258-259
Sales engineers (421)	258
Sales representatives, mining, manufacturing, & wholesale (423, 424)	259
not used	260-262
Sales workers, retail and personal services	263-278
Sales workers, motor vehicles and boats (4342, 4344)	263
Sales workers, apparel (4346)	264
Sales workers, shoes (4351)	265
Sales workers, furniture and home furnishings (4348)	266
Sales workers; radio, TV, hi-fi, & appliances (4343, 4352)	267
Sales workers, hardware and building supplies (4353)	268
Sales workers, parts (4367)	269
not used	270-273
Sales workers, other commodities (4345, 4347, 4354, 4356, 4359, 4362, 4369)	274
Sales counter clerks (4363)	275
Cashiers (4364)	276
Street and door-to-door sales workers (4366)	277
News vendors (4365)	278
not used	279-282
Sales related occupations	283-285
Demonstrators, promoters and models, sales (445)	283
Auctioneers (447)	284
Sales support occupations, n.e.c. (444, 446, 449)	285
not used	286-302
Administrative support occupations, including clerical	303-389
Supervisors, administrative support occupations	303-307
Supervisors, general office (4511, 4513, 4514, 4516, 4519, 4529)	303
Supervisors, computer equipment operators (4512)	304
Supervisors, financial records processing (4521)	305
Chief communications operators (4523)	306
Supervisors; distribution, scheduling, and adjusting clerks (4522, 4524-4528)	307
Computer equipment operators	308-309
Computer operators (4612)	308
Peripheral equipment operators (4613)	309
not used	310-312
Secretaries, stenographers and typists	313-315
Secretaries (4622)	313
Stenographers (4623)	314
Typists (4624)	315
Information clerks	316-323
Interviewers (4642)	316
Hotel clerks (4643)	317
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